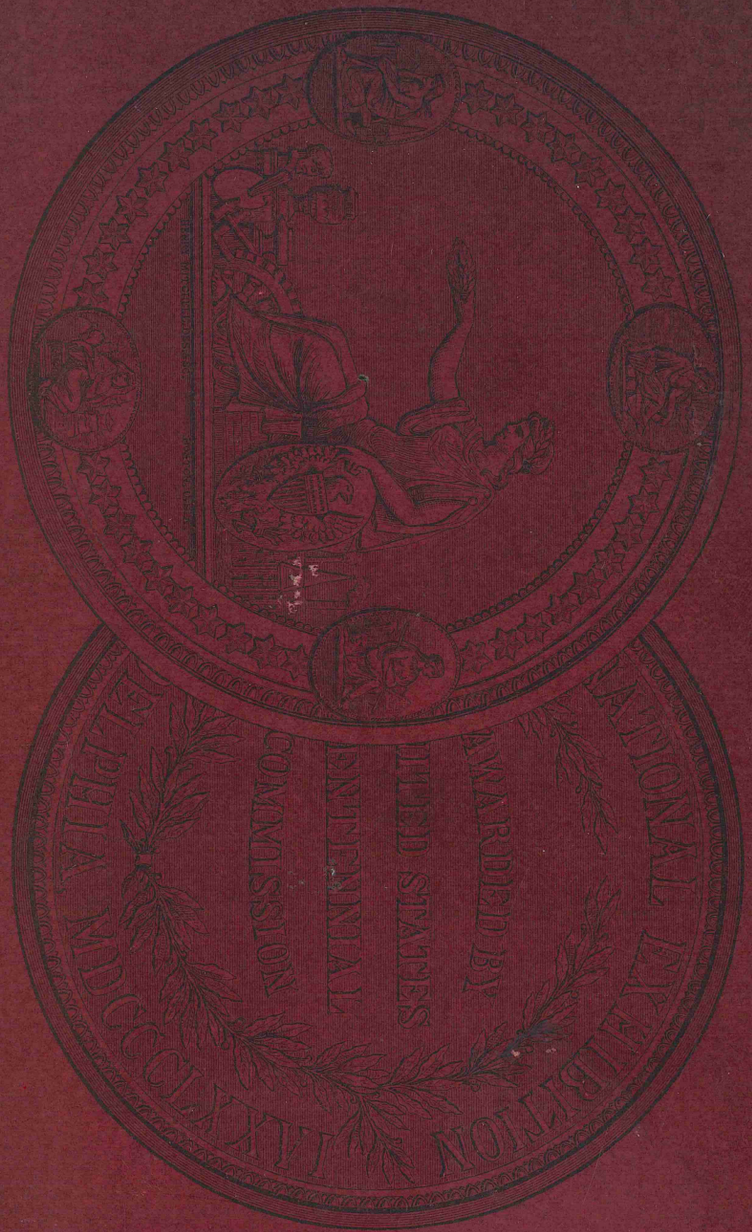


RESEARCHES

IN

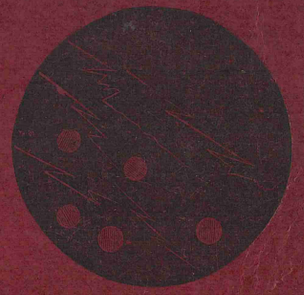
ELECTRO-ALLOTROPIC PHYSIOLOGY

USES OF

Different Qualities of Electricity to Cure Disease.

By Jerome Kidder, M. D.

Fig. 10.



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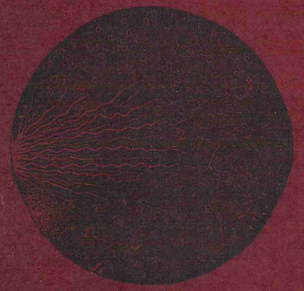

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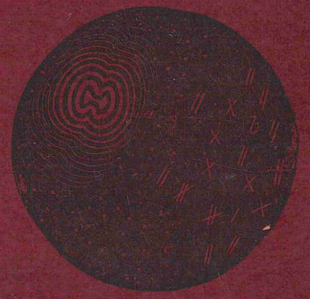

Fig. 12.

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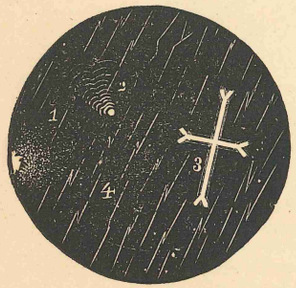

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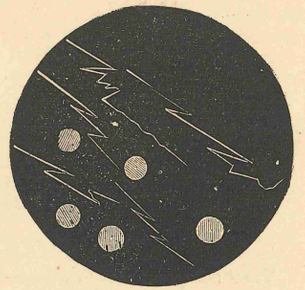

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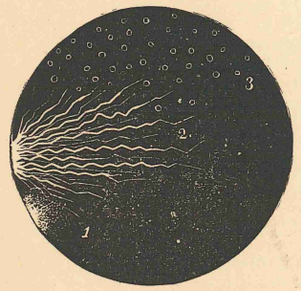

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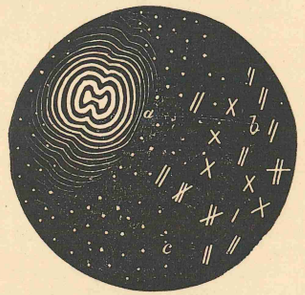

Fig. 12.

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ELECTRO-ALLOTROPO-PHYSIOLOGY.

Uses of Different Qualities of Electricity to Cure Disease.

Exceedingly interesting, as far as it can be understood, is the manner in which certain qualities of electricity advance vital processes and so aid nature in the cure of disease.

In examining this subject, let us consider the great law of *allotropism*, and (its allied term) *isomerism*, the former expressing the difference between bodies identical in composition, and the latter predicating identity of composition between different bodies.

There are many examples of the same elements forming different substances. Acetic acid, lactic acid, and grape sugar are each formed of the ultimate proportions of one part carbon, two of hydrogen and one of oxygen, as expressed by the following formulas :

Acetic Acid, 2 (C H^2 O)=C^2 H^4 O^2
Lactic Acid, 3 (C H^2 O)=C^3 H^6 O^3
Grape Sugar, 6 (C H^2 O)=C^6 H^{12} O^6

Butyric acid. Acetic ether, Aldehyde and Oxyde of Ethylene are quite different substances, yet they have the same percentage of composition, viz.:

Carbon,	54.55
Hydrogen,	9.09
Oxygen,	36.36
	100.00

Their composition is expressed by these formulas:

Butyric Acid, C^4 H^8 O^2
Acetic Ether, C^4 H^8 O^2
Aldehyde, C^2 H^4 O
Oxyde of Ethylene, C^2 H^4 O

Butyric Acid, C^4 H^7 O, H } O

Acetic Ether, C^2 H^3 O, C^2 H^5 } O

Aldehyde, C^2 H^3, H } O

Oxyde of Ethylene, (C^2 H^4) O

Oxygen exists in two allotropic states ; in one it is ordinary oxygen, and in the other it is ozone, which is called active oxygen, as it more readily decomposes many substances.

Iron exists in two allotropic states, in one of which it simulates the unoxydable character of gold or platinum ; and in the other state it is common iron, being very readily oxydable.

Charcoal, plumbago and the diamond, are only carbon existing in different allotropic states, causing them to differ as to their specific gravity, their conduction of heat and electricity, their power of absorbing, reflecting and transmitting light, and also in their relations to oxygen ; for there are varieties of charcoal which spontaneously take fire in the air, while the diamond can be burned only in pure oxygen.

The peculiar state of bodies may be retained when they unite with other bodies to form compounds. So carburretted hydrogen and otto of roses, which have the same ultimate composition, may differ, as Millon suggests, in the one containing charcoal carbon, and the other, diamond carbon. If carbon and hydrogen unite, it is possible we may have three different compounds—one containing charcoal carbon, a second plumbago carbon, a third diamond carbon, or if we designate these respectively *Ba* C*p* C*y*, we may have for their formulas, C*a* H, C*p* H, C*y* H.

Influences Change an Element.

Influences change an element from one allotropic condition to another, and new chemical changes result therefrom. Sparks of electricity through the air change a portion of the oxygen to ozone. Oxygen set free from water by the galvanic battery is often in a similar state. The indigo ray by itself, or existing in light, changes chlorine from the passive to the active condition, as instanced by its causing chlorine and hydrogen to unite with an explosion. Contact with spongy platinum has the same effect on these mixed gases. Pure chlorine gas expanded by heat, condenses again on cooling, but expanded by blue and violet light, retains its expanded bulk permanently. The expansion is not more than one-tenth as great when submitted to red rays, which shows that it is not the heat of the ray, but the quality of the ray itself that causes the expansion.

Iron, by a simple process, which any one can perform, (as will be shown further on), assumes the nature of gold or platinum as far as its oxydable character is concerned, and can as readily be thrown back to the nature of common iron. Thus two pieces of iron may be conditioned so as to compose the elements of a galvanic battery, one answering to the platinum, and the other to the zinc.

The basis of the physiological vital processes are the chemical affinities with their *allotropic variations*, without which there could be no contraction of muscle, no action of the brain, no mental wakefulness ; nor even could there be sleep, for sleep is a condition in which the vital process of recuperation takes place—a restoration by means of a particular relation of the chemical affinities governed by special *allotropic* conditions of the elements of repair. When the mind has been very active, there is increased elimination of the products of waste of brain material, principally the oxydized compounds of phosphorus.

Also, when there has been great muscular activity, there is increased elimination of the products of muscular waste,—urea. the oxydized compounds of sulphur, carbon, etc.

To repair the wearing constitution, digestion, which is a regulated chemical action, takes place within the organs designed for this process. But digestion could take place, *in a certain degree*, without the agency of the nervous system, yet it cannot be denied that certain nerves preside over that function, for it is well known that a genial condition of the mind aids digestion, while fear or a depressed state of the nervous system, interferes with nutrition, circulation and digestion.

With regard to muscular contraction this law also applies. For though motor nerves preside over the contraction of the muscles, yet this power of contraction exists in muscular fibre, causing it to contract from other external stimuli, independent of and without regard to the presiding influence of nerves. In some of the lower animals, muscular fibre is distinct, not connected with nerves, as in the vorticelli and infusoriæ. This inherent irritability of muscular fibre is designated by different terms, viz: *Vis Irritabilitatis*, Vis Vitæ, *Vis Insitæ* of Haller, *Vis Vitalis* of Gorter, *Oscillatio* of Boerhaave, *Tonic Power* of Stahl, *Vita Propria*, Irritabilitas Halleriana, *Inherent Power*, Excitability, etc. This power of inherent responsive movement of muscular fibre, when acted upon by external stimuli, is a vital property which belongs to all living animals. Notwithstanding the inherent irritability of muscular fibre, it is still more familiar to general knowledge that the nerves, also influenced by the will, have the power to cause these contractions.

As regards mental processes, the will through the nervous system, to a great extent, determines how great shall be the action of the brain, and therefore, to a

certain extent, decides when those elements—phosphorus and oxygen—shall possess the allotropic conditions, giving them affinities which cause them to go into that manner of union which determines processes of reasoning and calculation.

Also, the will, through the nervous system, determines how great and of what character shall be the action of the muscles, and therefore, through the nervous system, decides when those elements—sulphur, carbon, hydrogen, nitrogen, oxygen—existing in the organized muscle, shall be modified in their allotropic conditions to have such affinities that their consequent unions contract the muscles, yielding urea, creatine, extractives, etc., which, in their further changes, are resolved to urea, sulphuric, carbonic acids, etc.

Electricity Closely Allied to the Nervous Influence.—Construction of an Artificial Nerve.

Though electricity is not itself the nervous influence, they are closely allied. They differ in rate and character of conduction. Electricity moves at the rate of about 288,000 miles per second, while the nervous influence moves at the rate of about 111 feet per second, more or less, according to modifying conditions.

Now let us construct an artificial nerve, and observe how it behaves on applying certain kinds of stimuli which excite the nerves in a living body.

Here are three test tubes, nearly filled, the first with nitric acid, specific gr. 1.399, the second with nitric acid sp. gr. 1.375, the third with nitric acid sp. gr. 1.250.

1. Into the tube containing nitric acid sp. gr. 1.399, I place a wire or small rod of iron.

2. Now the nerve of an animal consists of an external sheath, the neurilemma, corresponding to the glass tubes, as far as its use is as a vessel to contain the working matter. Next, there is the medullary substance, called the white substance of Schwan, which is an albuminoid body, (in which exist the constituents of nitric acid), corresponding to the liquid in these tubes.

In the centre, surrounded by the white substance, is the axis cylinder or band corresponding to this wire or rod of iron in the solution contained in the tube.

Though iron is usually active, readily decomposing in nitric acid, yet this wire, after slight action at first, has become perfectly passive, no action whatever taking place, as though it were platinum or gold. Fig. 1.

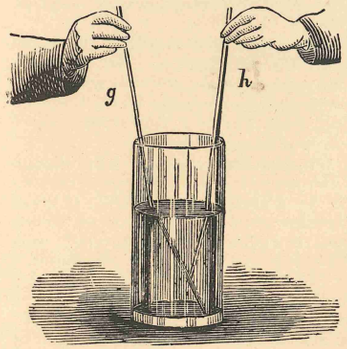


Fig. 1.—Nitric Acid, sp. gr.. 1.399.

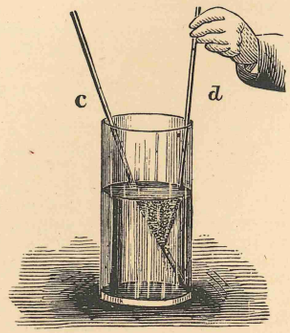


Fig. 2.—Nitric Acid, sp. gr. 1.375.

We now place this wire in the nitric acid, sp. gr. 1.250, and it is still passive, but if it had been *first* placed in this same acid it would have been active. We now dip into this same solution another wire, a common iron wire, which is active; a brown substance gathers upon it, and immediately small bubbles begin to rise from it. With this latter wire we touch the former inactive wire, and immediately it is changed to its common condition, and chemical action commences upon that also. There was no perceptible lapse of time in which the changed condition progressed from the point touched to the more remote parts, as action by the acid appeared to the eye to be simultaneous upon all parts of it. Fig. 3.

Fig. 3.—Nitric Acid, sp. gr. 1.250.

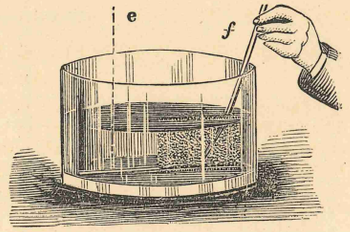


Fig. 4.—Nitric Acid, sp. gr. 1.399.

But under modified conditions the allotropic change progresses more slowly, showing its movements plainly. We will first change the wire back to its former passive state by associating it with a wire of platinum, or with another wire already in the passive state, and *gradually* introducing them into the acid, sp. gr. 1.399, the platinum, or the inactive wire, extending lower so as to go in *first*. Observe that this wire has again become passive, no chemical action taking place. But on placing it in the second tube of acid, specific gravity 1.375, and touching it with an active wire, activity begins first at the part touched, and thence progresses onward, till the whole has become active. Fig. 2.

Again making this wire passive as before, we place it in the tube Fig. 1, where we make firm contact with a wire rendered strongly active, and activity begins at the part touched, and moves much slower than in the tube Fig. 2, as shown by the rising bubbles.

In pure nitric acid the allotropic change in the wire sometimes moves very slowly, and sometimes after advancing a short distance from the point of contact of the exciting wire, it remains stationary, leaving a portion of the wire entirely inactive in the solution, while the remaining part is being rapidly dissolved by intense chemical action. Fig. 4. In some experiments, in tube Fig. 1 the allotropic change progressed at the rate of about one inch in twelve seconds, while in tube Fig. 2 it progressed at the rate of one inch in two seconds, and in tube Fig. 3 the rapidity of the change was so great that it seemed instantaneous.

In nitric acid, sp. gr. ranging from about 1.380 to 1.390, the allotropic change can be so governed that there will be pulsations of the active change following one another from the point of contact with an active wire; and under certain conditions these pulsations can be made to follow, the first a short distance, as one-quarter inch, the next, half inch, the next, three-quarter inch, and so on, each allotropic pulsation going farther than that preceding it. These pulsations may follow each other slowly, or at an interval of one or two seconds, or they may become more rapid, so that the intervals will be scarcely distinguishable, and still more rapid, to apparently constant action. Is it possible that all chemical activity goes on with successive intervals of activity and passivity, yet undistinguishably rapid, and *thus* produces in conductors rapid molecular movements which we call electricity?

An inactive wire is made active by even slight friction or a blow. Wiping it will render it active. A current of electricity will also render it active. Let the wires of

platina P and N, Fig. 5, be arranged so as to be conveniently closed with the poles of a galvanic battery.

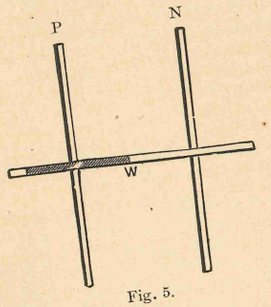


Fig. 5.

Across these lay the iron wire *w*, which has previously been rendered inactive by dipping into pure nitric acid. It is bright when laid there, and still wet with acid, but immediately on closing the circuit so that the electric current traverses the wire *w*, it becomes active, an allotropic change progressing from the positive pole, as shown by the acid on its surface becoming dark as it acts upon the iron.

As a law, this allotropic change begins at, and progresses both ways from, the positive pole, and moves the entire length covered with acid; but modifying conditions cause exceptions as to the point where the allotropic change begins. For instance, if the platina wires P, N, are the terminal conductors of a galvanic or faradaic current so weak that of itself it does not *readily* render the iron wire cross-ing them active, then that part of the wire which has been subjected to the more, however slight, attrition or concussion when laying it across, is first thrown into action.

That the electric current itself, without any attrition or concussion, has power to render the wire active, is demonstrated by using a battery of a dozen strong galvanic cells, and laying the inactive wire *carefully* across the platina wires P and N while the circuit is open in *another part*. The iron wire retains its inactive condition till that *other part* of the circuit is also closed, when immediately and always at the positive pole the allotropic change commences.

3. Now let us arrange the conditions so as to make the artificial nerve actually do what is done by the nerve of a living body. We take a vessel, as glass, containing nitric acid, specific gravity, 1.250, and place within it a porous cell containing nitric acid, sp. gr. 1.399. In each of these cells we place a strip of sheet-iron six inches long and one inch wide, which has been rendered inactive by the means previously stated, and each strip of sheet iron has a wire conductor brought into relation with a certain metallic helical arrangement which is also supplied with conductors that are grasped in the hands of the human living subject. No effect is yet produced. We take an iron wire one-eighth of an inch in diameter, which also has been rendered inactive by being dipped in nitric acid, specific gravity 1.399. With this we touch either of the sheet-iron strips below the surface of the acid, and still no effect is produced. But by rubbing this wire briskly for a few seconds, and with it again touching the strip of sheet-iron below the surface of the acid, sp. gr. 1.250, immediately there is excited an influence which is transmitted by the conductors to the helical arrangement, where it is modified and carried onward through the arms of the living human subject, the muscles of which contract powerfully beyond his control; also, by similar arrangement, and using more metallic surface, a small platinum wire can be heated so as to discharge a cannon, etc., etc.

We have seen that the allotropic changes moved along the wire rapidly or slowly, according to certain conditions, one of which was variation in the specific gravity of the nitric acid surrounding it. Now in certain conditions the nervous influence in the living nerves of the body moves quite slowly. In the Medical and Surgical Reporter of Jan. 4, 1873, Dr. Meredith Clymer refers to a case of loco-motor ataxia, where the application of heat or a pin was felt *many seconds after*. Longet states

that by the irritation of both vagus nerves the muscles of the stomach contract *after five or six seconds*.

Now let us make further reference to the substance of the nerves of a living body. Blood must be supplied to the nerve as one condition of its activity, and human blood contains iron, which is a substance highly susceptible of allotropic changes. Also the medullary substance, myeline, or the white substance of Schwan, which surrounds the central axis or band, as previously stated, is an albuminoid body, which contains Carbon, Hydrogen, Nitrogen, Oxygen, Sulphur, Phosphorus. All these exist in different allotropic states. Carbon, as we have seen, has three noted differences. The gases, in chemical combinations, are fluids or solids. Oxygen and nitrogen are the elements of nitric acid, and both sulphur and phosphorus exist in different allotropic conditions. Oxygen and hydrogen combined are water, which by admixture readily changes the specific gravities, and so varies susceptibilities to rapid or slow action.

According to R. D. Thomson, the brain contains a peculiar acid, which he calls cerebric acid, which contains nitrogen and phosphorus; this is mixed with an *albuminous* substance, with an *oily acid*, the oleophosphoric acid, with cholesterine, and finally with small quantities of oleine and margarine, and of oleic and margaric acids. Anhydrous oleic acid is carbon, hydrogen and oxygen, having the formula $C_{26} H_{33} O_3$. Anhydrous margaric acid is carbon, hydrogen and oxygen, having the formula $C_{34} H_{33} O_{37}$.

Thus we find that brain and nerve substance are composed of elements susceptible of an exceedingly great variety of combinations and allotropic expressions, capable of being exercised in the various duties they have to perform.

Elective Uses of Certain Ranges in the Qualities of Electricity.

The vibratory movements excited in the molecular particles of metallic wires, or in the ether contained in them, which movements are called *electricity*, have differences in their physical effects according to the character of those vibrations, and they are proved to have different physiological effects also. Vibratory or wave motions in particles of air or of ether, giving sound, heat, light, and chemical effects, have vast differences in their physical and physiological effects, and, by way of comparison, before going farther, let us consider these.

Very different effects are produced by merely different characters of vibratory or wave motions in the same medium. Long waves in the air produce sounds of a low pitch, and short waves sounds of a high pitch, and there are waves so short as to produce no effect on the human ear.

So in regard to the waves in the ether; one character of wave will produce heat and not light, another light and not heat; different characters of waves produce the different colors as shown in the spectrum, and a still different character of the waves produces certain actinic or chemical effects, which are quite different from the effects produced by heat. And these different characters of ethereal wave motions are principally differences in the rapidity and lengths of the same, the rays of heat being produced by waves slower, but of greater amplitude; then as the rapidity increases, and the amplitude diminishes, we have red, orange, yellow, green, blue, indigo, violet and the actinic rays which are also invisible.

The heat, the colored and the actinic rays, to a certain extent, overlap one another in the spectrum; also different kinds of refracting media give different degrees of refrangibility of the rays of heat compared to the color rays—through a

Water prism	it is found	in	the yellow,
Sulphuric acid	"	"	orange,
Plate glass	"	"	middle of the red,
Flint glass	"	"	beyond the red.

A cell of alum intercepts the rays of heat, but allows the light to pass, while a cell of iodine dissolved in bisulphide of carbon intercepts the luminous, but allows the calorific rays to pass.

The heat rays, if concentrated on a piece of platinum coated with platinum black, are accelerated so as to become visible; and likewise rays, passed through a solution of sulphate of quinine, and some other substances, are retarded so as to become visible—the visibility of the latter is called *fluorescence*. It is exhibited in an aqueous solution of horse-chestnut bark, by many compounds of uranium; a decoction of mad-

der mixed with alum gives a yellow or orange *yellow* fluorescence. Tincture of turmeric and yellow thorn-apple seeds diffuse a *greenish* light—all caused by lowering the refrangibility of the invisible actinic rays so as to make them visible.

As to the power of coloring plants green, Robert Hunt found that every variety of plant he employed appeared to be influenced by different rays. Cress and mustard became green most rapidly in the green ray, mignonette in the yellow, and peas in the blue—the influence was most decided between the mean orange and the mean blue ray, and plants became green more slowly in the red than in the blue ray. Guaiac resin, which is turned blue by exposure to sunlight, is not at all affected by any of the visible rays of the spectrum, the action beginning only in the ultra violet, and the maximum being situated a long way beyond the visible spectrum.

Light, heat and actinism are common to every ray, the difference being only proportional; a yellow medium gives most light and less actinism, while a blue medium gives more actinism and less light.

Light hinders the germination of seeds. Actinism quickens germination. Light effects decomposition of carbonic acid in growing plants, which absorb carbon and give off the oxygen. Light and actinism, independent of the calorific rays, prevent the developement of the reproductive organs of plants. The heat rays, corresponding with the extreme red, facilitate the flowering of plants and the perfecting of their reproductive principles.

Many bodies, under peculiar circumstances, are thrown into such a state of vibration that they emit light without perceptible heat, called phosphorescence. Decaying bodies, flowers of certain living plants, etc., exhibit this quality. Different rays of the spectrum differ as to their power of producing phosphorescence. Electric light produces phosphorescence more actively than the solar rays.

Very strange are all the foregoing varied effects when we consider that the calorific, luminous, chemical and phosphorogenic rays are all substantially the same in their nature, being each and all produced by movements of the ether, those movements differing principally in rapidity and degree.

The functional activity, not only of muscles, but of nerves also, is influenced by currents of electricity. And as a motor nerve electrically excited causes a muscle to contract, so also, as shown in standard works on physiology, regulated electrical excitation of the respective nerves presiding over the organs of digestion, secretions, circulation, etc., influences their functional activities. Now we should look also for electrical influence over the functional activities of other organs themselves without regard to presiding nerves, just as much as we look for electrical excitation to influence a muscle directly without regard to its presiding nerve. It seems that we must recognize this when we consider the fact that *each element* in the organism has its *individual activity*, which is evident from the comparison of vegetable and animal organizations, the independent developement of tissues after the evolution of the germ, physiological dissections on the living animal, the mode in which poisons act, etc., etc.

A very important fact to consider is that the different organs of the body have their gradations as to susceptibilities to different qualities of electricity. An induced current on a coil of wire ot a certain ratio as to length, thickness, number of convolutions, with certain other modifying conditions, electrically excited, will cause powerful muscular contractions, but will produce very little light to the eye. Now if we arrange another coil of wire so as to yield a current of much higher intensity and less quantity, this latter conditioned coil being excited in the same manner as in the former case, will have less effect on the irritability of muscular tissue, but will produce light to the eye, when the current is regulated to be so weak as not to produce pain; will, when properly used, have a more soothing effect upon the nerves—will better relieve nervous headache, and cause deeper inspirations by properly influencing the medulla oblongata and cervical spine, the negative, with large wetted sponge, being the preferable electrode on those regions.

Now if another coil is conditioned for considerable greater quantity than the first-mentioned, but far less intensity, ranging from A B to A C, in Dr. Kidder's improved apparatus, it will produce no light whatever to the eye, even when the current is strong enough to produce pain—it will not contract the muscles so powerfully—it will not so well soothe pains in the system; but by its influence, using the positive as the

preferable pole, it will exercise a remarkable specific effect in restoring to their normal condition muscles that are sore from the effects of over use and strains, and all allied conditions.

In this respect a more special contrast in the differences of these qualities will be here presented. Placing the negative pole farther towards the extremities, and using currents of sufficiently high intensity and low quantity, graded to the strong muscular contracting tendency, as in the current A D, Dr. Kidder's improved instrument, a strong power can make the muscles sore and lame. Now using the current from A B or A C with light power, and using the *positive* pole upon the lamed muscles, the soreness and lameness will be almost immediately cured, when otherwise it would not pass away for a considerable length of time. These results became known to Dr. Kidder first by many trials upon himself, which have been amply corroborated by trials upon others. Inflammatory excitements, as burns, etc., will be better relieved by the negative, using very *large* surface of sponge, or what is better, having the part in water with the negative electrode, and using especially currents of high intensity and low quantity, as A E of the improved instrument.

Further considering this subject, we may contrast the two *general* processes, which are the opposite of each other, that take place in the living body. One is nutrition of the tissues of the various organs, and the other is the functional activity of those organs, which wears away the tissues; and they again call for more nourishment, without the supply of which their activity would soon cease. The assimilation of nourishment in the tissues takes place more during the night, while the body is at rest. The using up of the tissues takes place more during the day, when the body is active. Now the relations of electricity to these two conditions appear to be these. Electrical currents, especially of the induced order of *high intensity* and *low quantity*, act comparatively more in producing functional activity of the various organs of the body, though somewhat different range of the ratio of quantity and intensity of the current is best adapted for the different organs, which is shown by the different ratio required to best excite the motor and the visual functions. But currents of comparatively lower intensity and a higher quantity are the better range to produce the allotropic changes that bring wearied organs almost immediately to a rested condition.

In the former case it is better to excite the various organs with the negative pole, having the positive more central toward the medulla oblongata, while in the latter case it is preferable to use the current in the opposite direction.

Now if a wire be conditioned so that the vibration of its particles should be similar to those produced in either by white light, why should it not produce light to the eye? Why should it not excite whatever substances are in the eye and brain that correspond in their effects to the fluorescence produced in sulphate of quinine, by the lowering of the refrangibility of the invisible actinic rays so as to make them become visible rays, and why should they not also exhibit phenomena of colors?

So we find that the functional activity of different organs of the body, and the processes of their repair, respond better to different characters of vibratory movements which we call electricity.

The Exercise of the Visual Functions.

By using the proper electric currents, the eye and the brain may indeed experience phenomena, like to the reception through the eye of white light, colored light, and light of the characters called fluorescence and phosphorescence.

Dr. Kidder has made costly Electrical Apparatus, having the current ranged in quality to produce more special varied optical phenomena, which are not observable effects of his more ordinary apparatus. One of these instruments was placed in the hands of an artist, for him to illustrate the visual phenomena produced by the current, and the following are the results which he gave, after thorough experiments with currents of pretty strong power:

Fig. 1. Placing the sponge to the bone over the left eye softly, observed lines of light, which were sometimes straight, with slight flashes crossing them, (all white light).

Fig. 2. Now by pressing hard against the bone on the right side of the right eye, there is a great change. Immediately globes of a red color shoot from the right to the left slowly, and blue globes (1) will burst asunder like meteors and

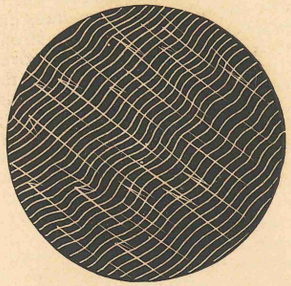


Fig. 1.

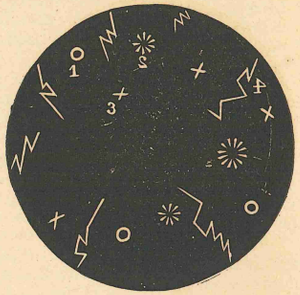


Fig. 2.

instantly disappear; small yellow star-like shapes (3) will continue to travel up and down, while instantaneous white flashes pass through the field. There is also a slight ringing in the ear.

Fig. 3. Moving the sponge across the forehead (at eyebrows) to the left eye, there are vivid flashes (2), while yellow spots move rapidly across, dying out near the centre (3), while a bright light (1) at the left moves up and down. Fig. 3 is on first page.

Fig. 4. Sponge over the right eye, there is a yellow light on the left side, dying out at the centre, trembling as it dies into darkness. There is a humming noise in the right ear.

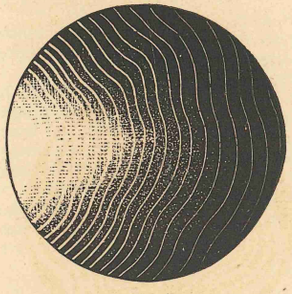
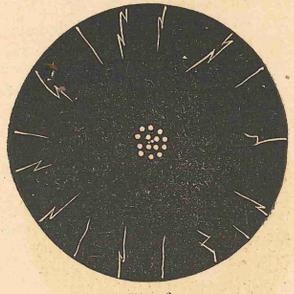


Fig. 4.



Flg. 6.

Fig. 5. Rainbow colored globes slowly moving from left to right, while flashes cross from left to right: the sponge is now on the eyelid and considerable force of the current (7 minutes) pressing hard. Now placing sponge on the left eye, Fig. 6 came to view. Fig. 5 is on first page.

Fig. 6. Sponge on left eye, pains run over the head, the short yellow flashes appeared, while in the centre were light blue spots rapidly appearing and disappearing. (Strong power of the current.)

Fig. 7. After resting ten minutes, the sponge was placed in the corner of the left eye by the bridge of the nose,—strong power of the current was applied, when I received a violent shock and a reflection, as sunlight on the ceiling is reflected from a basin of water, moving at an angle up and down, the centre ring being the brightest, and dying out as they came near to the surface of the field of vision.

Fig. 8. The current was now made very weak, and pressing the sponge on centre under the eye, an object like a coiled snake appeared, with flashes of light

around it. These became more vivid by harder pressing with the sponge, and they moved constantly, dying out at the tail with a flash, the *base of supply* being the centre *a*.

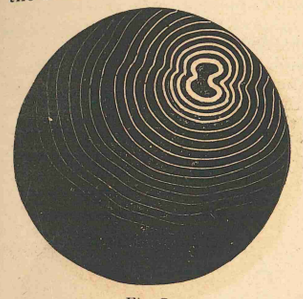


Fig. 7.

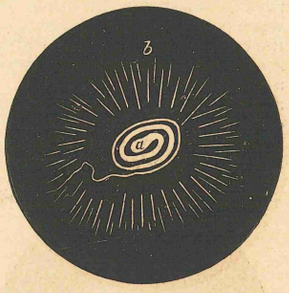


Fig. 8.

Fig. 9. Feeling a pain on the top of my head, I removed this in a very short time by using the proper current, in the manner recommended by Dr. Kidder. Then placing the sponge on the right corner of the right eye, and making the current strong, globes (*a*) of a rainbow-colored appearance moved slowly from the left to the right, but died out as they come in contact with (*b*), another ball or globe of light the same size but different in character, as the light in (*b*) radiates from the centre to a bright yellow ring. As the two globes met, the (*a*) changed into purple and disappeared, while (*b*) moved downward, keeping on the right side (*c*), raining dark blue spots, and making an instantaneons disappearance.

Fig. 10. A trembling light, and bright spot (2), dying as it leaves the ring—and by rubbing the sponge from left to right the form 3 appeared; half red and blue shot out with a strong light at the left side, but very small. This was followed with small flashes (4), the current being kept to the right eye thirteen minutes. Fig. 10 is on first page.

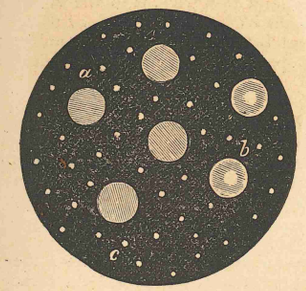


Fig. 9.

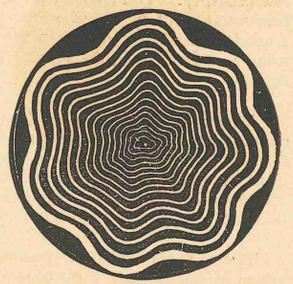


Fig. 11.

Fig. 11. Placing the sponge now to my left eye, and making the current strong, I saw stars in about four seconds. Rings vibrating came from the ends, growing weaker as they approached the centre, where they died out entirely. This was very beautiful. It commenced with yellow at the first ring; about the fourth or fifth ring they became red, and disappeared in a faint blue.

Fig. 12. Producing this, I placed the sponge wetted with water to my right eye, and in a few seconds the spots (*c*), of a blue color, first came to view; then moving the sponge to the right side of the eye, bars appeared and disappeared; these were of different colors; there were sometimes from three to four bars upon one another, in the manner in which crystals are observed in wine. Moving the sponge to the

orbit and pressing hard, (*a*) came to view and moved to an obtuse angle the same as in Fig. 7.

Fig. 12 is on first page.

Fig. 13. Two hours after the former experiment I used the current again, moving the sponge in a line from temple to temple, running over the forehead, when on a sudden I placed the sponge over the orbit of the right eye, and made the current strong. There appeared a bright light, dying out in the centre, when it changed to an oval shape as bright as a calcium light (*a*). In about two seconds a blue ring formed around (*a*) and enlarged, when another yellow ring formed around the blue (*b*) dying out at the edges (*c*); then it moved as a pendulum of a clock (*aa*), when flashes or small jets came from the rim, finally dying out. Now moving the sponge to the corner of the eye by the bridge of the nose, and pressing, a general explosion took place, as shown by the Fig. 14.

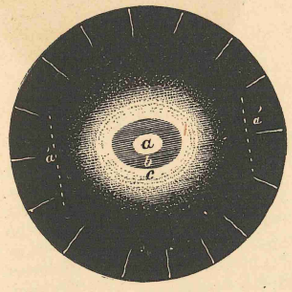


Fig. 13.

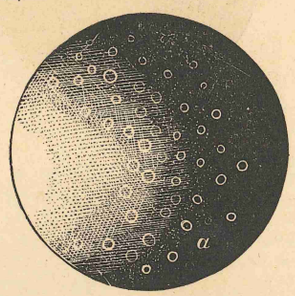


Fig. 14.

Fig. 14. A white light dying out at the centre of the field, with small rings running from right to left, and dying before reaching the rim. These were of a bright red color, and blue when dying; a few waving lines were also visible.

The function of hearing is best exercised by currents of high intensity, though of low quantity. The current on a comparatively short and thin wire, is to the sensation what may be called sharp, cutting. The modified effects produced by using a condenser so as to lengthen the spark of the current between separated electrodes, from a definite coil, does not extend to produce specially different physiological results.

All Dr. Kidder's 5 post (4 coil) apparatuses have the qualities that are more expensively obtained, in the smaller machines as well as in the larger. The smaller the coil, there is necessity for equal, or even greater expense, *if made* to obtain the qualities of currents like those of the larger coils. However, extra large coils when constructed to have currents that reveal *colors* to the vision with a very mild current, necessitates still more expensive apparatus.

Through its allotropic powers, the nervous system not only presides over the action of organs and the replenishing of their wasting tissues, but also, to a great extent, it provides remedy for adverse adventitious impressions, as poisons, etc. For example, typhoid fever is seldom taken except when the nervous system is in a somewhat depressed state; and always when any kind of disease is prevalent, the condition of the nervous system very much determines whether attacks by that disease will be experienced, which is a fact well known. By such offices of the nervous system, which seem almost miracles, like a guardian angel, undoubtedly we are daily protected from many unseen and unknown dangers surrounding us.

In regard to the artificial nerve, previously mentioned in this work, it may be here stated that the conditions may be modified with substantially the same principles; the specific gravity of the acids may be somewhat varied—one quality of acid alone can be made to answer for both the inactive element and the element

thrown into action. Other elements, omitting iron, may be substituted for the one to remain inactive and the one to be thrown into action. An exciter, as an iron wire not rubbed, but already active, may be used—attrition or concussions with other substances, and even an electric current, may be used as exciters of the allotropic influence.

If the nitrogen and oxygen and hydrogen existing in the nerve were all in the form of nitric acid and water, the influence would be destructive rather than appropriate to fulfill the regulated uses of the nervous functions; but the combinations in which they enter, forming other substances, from which these elements may be eliminated in a manner regulated to the very small amount required, manifest the perfection of their adaptability for the most delicate and exceedingly varied adjustments individually requisite for the quality and degree of effect required. The elimination of phosphorus, etc., through nervous action from its special association in the nervous substance, has attracted much attention.

As the influences of the nerves are of manifold character in their presidency over motion, secretion and digestion, even so in regard to sensation—their influences are also manifold; for there are many characters of sensation,—smarting, itching, pricking, different characters of aching, stinging, etc., as pain produced by heat is different from pain produced by cold. And the sensations of hunger and thirst are different from each other. The sensations of taste appear illimitable in their variety, even as that of smell which also we cannot limit, for it is not known how many different substances affect this sense differently—all these through the nervous system.

And even as different qualities of sensation are brought to the brain by the nerves, recognizing differences in the character of the stimuli, even so we may look for a controlling nerve force going out from the brain in certain conditions, which represses sensations from certain stimuli, which, under ordinary circumstances, produce pain. For example, soldiers, in the excitement of battle, are often unconscious of severe wounds, from an absence of pain until after the mental excitement has passed away.

Now there is a range in the quality of induced electricity which, to a certain degree, excites *repressing power* of nervous influence *over* that which is the sensation of pain. Induced currents of a high intensity and low quantity, if of the proper range in this respect, as A D, or more especially A E, in Dr. Kidder's Improved Apparatus, and properly used, will, in their mixed effects on the various nerves, act more to repress pain than to excite sensation.

The author has made reference to the allotropic influence as the *nerve influence*. The conditions may be so arranged that the allotropic changes will move at precisely the same rapidity as those of the vital influence along the nerves which produce motion and sensation. But as these allotropic changes, under certain conditions, give rise to currents of electricity, we must be prepared, *if such conditions are found in the nerve*, to accept the view that the *electricity* which is produced by the allotropic influence may *execute* the vital mandates by exciting other allotropic changes in the elements of organs and parts; for we have seen (page 6) that electricity produced allotropic changes, and allotropic changes, as effected in the artificial nerve, gave rise to those vibrations in conductors which we call electricity, which could be made to produce motion, sensation and other vital phenomena. The conditions of the artificial nerve were so arranged that, when a certain allotropic state was established, that artificial nerve *was a galvanic battery*. Now a nerve belonging to the living organism appears to have precisely the same conditions—we have the neurilemma to contain the elements, we have the myeline or the white substance of Schwan as one of the elements, and we have the axial band as the other element. Therefore, the nerve is not only a medium of allotropic changes and a conductor of electric currents, but it also appears to be *itself a galvanic battery*, which is active or inactive, according to the allotropic conditions of its elements.

How slight an influence is sufficient to cause allotropic transformations and consequent powerful chemical unions may be instanced by means of sounds of certain degrees of pitch causing the explosion of certain substances.

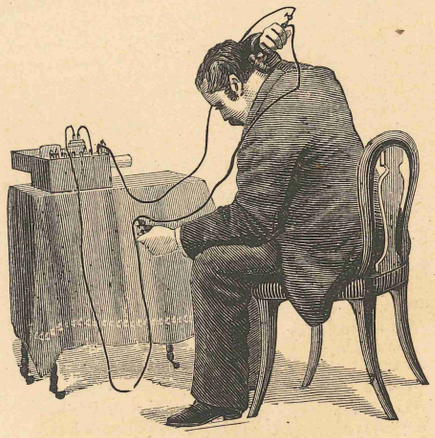
So we find that the allotropic condition which moves slower than electricity is, in one of its offices, approximately, as it were, a switch to throw the nerve, as a galvanic battery, *in* and *out* of action! As we know that electricity can excite allotropic changes, and that allotropic changes produced by any means, can excite electricity;

it seems that in either case we have explanation enough to account for the allotropic changes necessary to bring about the activities of functions and the nutrition of parts.

But the allotropic transformation was in somewhat different relation to the battery from that merely of a switch to connect and disconnect the poles. The elements of the nerve are not a galvanic battery *until made so* by the allotropic change; in one moment the nerve is a galvanic battery, and in another moment it is not; therefore this allotropic change is the primordial force *within the body* for the establishment of the nervous influence, though electricity produced thereby may be the agent to *execute* the design by establishing certain other allotropic conditions in the elements of muscular tissue, which cause contraction, and in the brain to produce sensation, and in other organs to advance the processes of secretion, digestion, assimilation, etc. Allotropism, the primordial force within the body—within the constitution of the organs concerned,—but outside of the body a thousand agencies operate as impressions to establish these allotropic changes; they are the stimuli which excite us to action, quicken our hopes, and furnish us constantly with the evidences whereby we know that we live.

The question may be asked, Why are different ratios of quantity and intensity of induced electricity necessary severally to excite the functional activities of vital parts? It may be answered that chemical changes are effected by vital activities, the elements concerned being *electrolytes*. The electrolytic activities in the different organs are varied, and their susceptibilities to allotropic changes are different; therefore a different ratio of quantity and intensity of electricity is required to bring them severally into action.

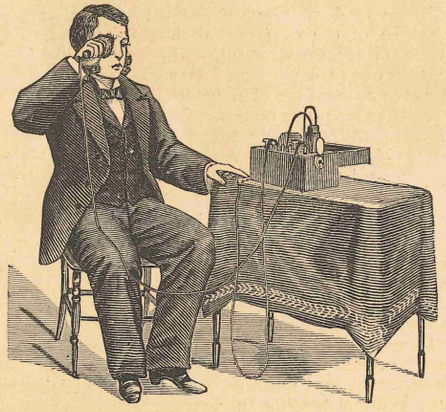
The author has endeavored to present this seemingly interesting subject with consistent brevity, and at the same time he has made such repetitions of the subject, with varied phraseology, as are perhaps requisite to be well understood, considering the imperfection of his language.



To cure nervous headache, place on the back of the neck close to the base of the brain, a large wetted sponge attached to the conductor leading from the post E, while the positive pole from A or B is in *both hands* by some means, or under both divested feet—*both* to give a large surface, because much power being comfortable at the base of the brain, large surface is needed for the other electrode. Frequently headache is entirely cured in half a minute by this mode of applying the proper current. Do NOT apply the current on the forehead, for it is very sensitive, and such application is useless and injurious if applied strong. Without divesting the feet, the practitioner can conveniently test the current on himself thus: By means of an improved patented sponge-holder, which has an extra hollow metallic cylinder surrounding the insulating wooden handle of

the holder, the positive pole, A, can be led both to the electrode held in the left hand, and also, by an added conducting cord to the outer metallic cylinder of the sponge-holder, without communicating at all with the other pole, which latter is the negative, E, led through the centre of the insulating wooden holder to the base of the brain.

To cure a severe burn, place the pole from E in a tub of water; give large surface to this negative electrode by adding metallic plate of any kind resting on the inside bottom of the tub. Place the part burned in the water, and apply the positive pole from the post A or B under both feet to give large surface. A strong power thus applied will be comfortable to the burn, relieving the pain altogether. Continue the application for an hour or two, or until the pain will not return on ceasing the application. Protect the part from the air as a precaution; but cases are known in which it was not necessary after electrical treatment of this kind.



The above cut shows how to exercise the function of vision with the current from A, E or B, E. Place to the eye a large wetted sponge on a sponge-holder, attached

to the negative conductor of the post E; then, with a very mild power of the machine, close the circuit by merely touching with the finger the electrode (as a metallic cylinder or handle) attached to the conductor from the post A or B. Use moderately slow interruptions of the spring, and increase the power gradually, first by applying more surface of the finger or hand to the positive electrode, and, perhaps further, by withdrawing the tube from the helix. The light can also be seen by placing the sponge on the side of the head near to and on a horizontal plane with the eye, or at the corner of the eye. Persons totally blind from cataract will perceive the light caused by the electric current precisely as well as those not so blinded.

Because Duchenne records that he injured the eyes of one of his patients by the use of a galvanic battery of many cells without an induction coil, some persons, from confounding different apparatuses, seem to fear to test or experience the effect on the eye from an induction apparatus. If they will read carefully Duchenne's article, they will find that he makes a clear distinction as to apparatuses. He had applied an induction coil with benefit to his patient; and that special coil not being conditioned to show light to the eye, he erroneously concluded that the reason was that it was an induction apparatus, not knowing that an induction apparatus could be constructed so as to exercise the function of vision with a very mild power and in a perfectly harmless manner, by a current wanting as to ordinary chemical effect; whereas if the light were caused by a large number of *cell* batteries, or elements, the eye would be injured by the chemical effect of the current.

ALL BODIES SUSCEPTIBLE
(In a Greater or Lesser Degree)
TO MAGNETIC CONDITIONS.

Coulomb, in 1802, as stated by Noad, rigorously tested the supposition of universal magnetism, by the employment of a glass receiver, from the top of which by a silk fibre, was suspended the substance to be examined, about an inch long, and one thirtieth thick. "The receiver was then placed so as to enclose the opposite poles of two powerful bar magnets, each formed of four bars of steel tempered to a white heat, and the number of oscillations of the needle between these poles was noted. It was found that *all substances whatever, when formed into small needles, turned themselves into the direction of the poles of the magnets*, and, after a few oscillations, finally settled in that position. When these bodies were moved a very little way out of their position of equilibrium, they immediately began to oscillate round it—the oscillations being always performed more rapidly in the presence of the magnets, than when they were removed out of their influence. Gold, silver, brass, wood, and all other substances, whether organic or inorganic, thus obey the power of magnets. Hence we must conclude either that all bodies are susceptible of magnetism, or that they contain minute particles of iron, or other magnetic metals, which give them their susceptibility."

"Dr. Subeck found that in alloying magnetic with non-magnetic substances, *he formed compounds which exercised no action on the* needle. The alloys which had particularly this singular property were those consisting of four parts of antimony and one of iron, or two parts of copper and one of nickel. In these cases the magnetism of the two ingredients must have been neutralized by their opposite actions.

The blind have been able to distinguish alloyed metals, or coins, to an extraordinary degree, by the sensation of touch. Has not the electrical state of those metals, as well as their modified surface, much to do in determining this result to the highly cultivated sensitive nerve? Still more extraordinary, the blind have been able to distinguish colors by the sense of touch alone!

The mind itself may FEEL foreign bodies before they are touched by the body of the person. Many persons can know without seeing when a foreign body is brought near the head. Is not the mind itself some kind of magnet, which, under favorable conditions, acts directly on bodies, and thus recognizes their presence?

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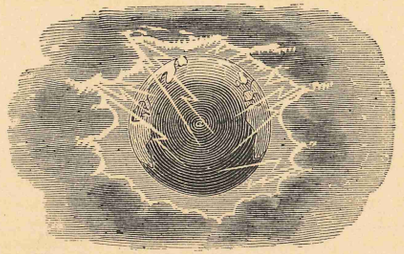

"Your method of varying the *Primary* as well as the induced currents, surpasses all other devices I have studied, as tested by scientific instruments and by physiological effects."

R. OGDEN DOREMUS, M. D.,
Prof. Chemistry and Physics in the N. Y. City College, and Prof. Chemistry and Toxicology, Bellevue Hospital Medical College.

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Summary as to Different Physiological Qualities of Electricity.

Currents of different qualities have not only different characters of sensation, and different effects on muscular irritability, as recognized by all who have carefully scrutinized in regard to these various electrical phenomena, but also **one quality,** even when so weak in **power** as not to produce any pain, but rather a pleasant sensation, will show flashes of light when properly applied, as with large surface of wet sponge over the closed eye.

Secondary currents produce light to the eye, that is, they exercise the function of the optic nerve, *without producing pain*, only when the tension of the current is increased to a certain degree in ratio with the diminished quantity. This effect is shown *best* by using the negative sponge at the eye, and having not very slow, but moderately slow interruptions by the vibrating armature, as produced by Dr. Kidder's apparatus; yet the proper quality as regards tension or pitch is requisite.

Another quality of current, even when the current is made strong enough to produce pain, will show no light to the eye—will not exercise the vital function of the optic nerve.

The preceding facts show conclusively that electricity can be varied in quality so as to produce different effects on different vital functions.

It must not seem strange to find electricity produced in many different qualities to have varied effects. There are, indeed, other facts recognized as true, and which might seem stranger still—for it is well known to all chemists, that the same proportion and kind of atoms may form substances so different in their nature as to be recognized as entirely different substances. For example, spirits of turpentine and oil of bergamot are identical in composition, being composed of ten atoms carbon, and eight of hydrogen, and the difference is recognized as merely that of the allotropic conditions and arrangement of the atoms. Also, **light** is recognized as the effect of vibrations or wave motions in the ether, which is everywhere; and the different colors result from the different length of these waves. (See Prof. Draper's *Chemistry*, and other scientific text-books.) And yet, even the difference in the character of the vibrations or wave lengths of the ether gives a difference in their chemical effects; for, indeed, it is known to be chiefly the yellow ray which causes the absorption of the carbon from the carbonic acid gas in the atmosphere into the solid form of a tree, by the influence of the sunlight falling upon its leaves. And it is the indigo ray which is chiefly concerned in causing hydrogen and chlorine to unite by passing light through a glass vessel containing a mixture of the two gases.

Also, sound results from **vibrations** in the atmosphere or other media. Yet sound may have differences in pitch, and also differences in qualities of tones, having the same pitch. Its effects are what the spirit of man receives as jarring discords or sweet harmonies, and successions and qualities of tones, that inspire the emotions of courage and hope, or produce solemn and mournful feelings.

Considering the fact that mere variations or modifications in vibratory or wave motions produce differences in effects, we should not think it strange, but should rather **expect,** that the magnetic influence which excites the electricity in metallic helices would produce currents modified in qualities, by varying the physical condition of those helices; for, by varying the helices, we vary the medium of vibratory or wave motions resulting from polarizations, whose phenomenon is electricity.

It is because the terms *quantity* and *tension*, as applied to electricity, do not express the real distinction in its qualities, that the terms are so generally misunderstood when thus used. The term *intensity* is often misused for power, but the difference is as plain as the difference between *loudness* and *pitch* in regard to sounds. A musical string *conditioned* for a given pitch *does not change that pitch* by a greater or less force of the blow causing it to vibrate; it simply changes its *loudness*. And in regard to electricity, the magnetic force upon the helix determines the power or strength of the induced current; but the intensity or tension, that is *quality*, is determined, not by the amount of magnetic force upon the helix, but by the *physical construction of the helix itself.* (See other pages of this manual.)

"USEFUL INVENTIONS.

"The employment of electro-magnetism in medicine is beginning to assume a proper importance since the investigations of Matteucci, Du Bois-Reymond, and others have thrown a flood of light upon obscure nervous affections, and have led to a proper appreciation of treatment. That electro-magnetism is hereafter to form no inconsiderable part of this treatment cannot be denied, and we must welcome any invention which tends to place this agency within the reach of the practitioner.

"KIDDER'S ELECTRO-MAGNETIC MACHINE

is one of the most useful inventions of the kind with which we are acquainted. It has six currents, differing in their magnetic, electrolytic, and sensational effects. It is very portable, and very easily kept in good condition. We have witnessed its frequent employment in various medical cases, and the results have convinced us that, in the hands of the judicious scientific physician, a large class of diseases are more amenable to such treatment than to any therapeutical means."—*American Medical Times.*

It is only in order to show how IMPORTANT are the facts which by strict investigation Dr. Kidder has discovered in regard to the many different qualities of electrical currents and the laws governing the production of the same, and to impress these facts on the attention of the public, that the following is quoted :

From the New York Tribune.

"At the Montreal meeting of the American Association for the Advancement of Science, in 1857, an evening was devoted to the splendid electrical phenomena which can be produced by the use of a powerful battery with the Ruhmkorff coil. It was stated that this coil was, as it really is, a triumph of American genius; that nothing could be procured in Europe which would compare with it, and that the shock produced was amply sufficient to kill fifty men. This latter statement, based on the known physiological effects of a shock from a current of much less power, has never been questioned among purely scientific men, that we know of, and the man who should propose to test it personally would be looked upon very much as would a man who should propose to test the effect upon himself of prussic acid or a flash of lightning.

"But Dr. Jerome Kidder, of this city, has dared to do it. He took this shock the other day in the laboratory of the Cooper Institute, and he is alive and well notwithstanding. The battery consisted of six of the large Bunsen cups, and the Ruhmkorff coil contained sixteen miles of wire. Prof. Vanderweyde prepared the apparatus, and vouches for the experiment.

"Dr. Kidder was led to doubt * * * * * * by his experiments in endeavoring to secure the best electrical machine for medical purposes. To the quack, electricity is electricity, as an egg is an egg; but the **SCIENTIFIC PHYSICIAN** (and electricity is beginning to be used in this country by physicians, though not to so great an extent as in Europe, where it is even introduced into the hospitals), demands an apparatus from which he can secure galvanism, or Faradaic currents—so called from Faraday, who discovered the induced currents—separately or in combination, of any required power, and of any required tension or capacity of penetration. Galvanism is required for instance, in mercurial diseases, where minerals are to be thrown out of the body, while the Faradaic current is required for action upon the sentient or motor nerves in paralysis, rheumatism and neuralgia. The use of the variation of power and tension is evident. All these Dr. Kidder has succeeded in obtaining by the use, now patented, of different helices, singly or in combination with each other, or with the galvanic current. Finding that the longer the wire used the greater the tension, and consequently the greater the ease with which the current is conducted through the body, he argued that the enormous length of the wire in the Ruhmkorff coil must render the current so highly conductable that, in spite of its great power, it would not lacerate the tissues of the body. He has staked his life on his opinion, and won it.

[There is a mistake in the above in regard to the Ruhmkorff coil being an American invention, for it was Poggendorff, in Europe, who invented the improvement in the winding of this coil, which is practically followed by all makers of such coils of the present day.—J. K.]

GOLD MEDAL

FOR THE

BEST APPARATUS EITHER HERE OR ABROAD.

The value of this award is shown by the status given to it by the American Institute in the Fall of 1875, thus :

"XII.—THE MEDAL OF PROGRESS.

This Medal (of Gold) is to be awarded only for a Machine, Product or Process which shall be adjudged so important as to make a decided advance and great improvement, and be satisfactorily shown to be a discovery or invention of the first order of importance and value in science or in the industrial arts."

This is the only genuine Gold Medal awarded for Electrical Apparatus by the American Institute, and, as far as we can learn, the only one for Electro-Medical Apparatus from any Institute or Society. And in the years 1876 to 1887, inclusive, awards for maintained superiority.

BEWARE

Of all Infringements upon our PATENT TIP BATTERY.

WE ARE SOLE PROPRIETORS. ALL PURCHASERS OF BATTERIES INFRINGING UPON OUR PATENTS ARE HELD LIABLE FOR ROYALTY (OR COST OF GOODS) TO THE **JEROME KIDDER M'F'G CO.**

CENTENNIAL EXHIBITION,

FALL OF 1876.

The discrimination in the Centennial Awards, as is well-known, existed in the written reports on awards by the Judges, and not in the medals, which were all alike.

INTERNATIONAL EXHIBITION,
PHILADELPHIA, 1876.

"THE United States Centennial Commission has examined the report of the Judges, and accepted the following reasons, and decree and award in conformity therewith, Philadelphia, Feb. 24, 1877.

REPORT ON AWARDS.

PRODUCT,
GALVANIC APPARATUS.

NAME AND ADDRESS OF EXHIBITOR,
JEROME KIDDER, M. D., NEW YORK.

The undersigned, having examined the product herein described, respectfully recommend the same to the United States Centennial Commission for award, for the following reasons: For the **SCIENTIFIC BASIS** and the excellent workmanship of all the exhibited apparatus; for the introduction of a new method to get very rare interruptions from a self-acting interrupter; for the fitness for the purposes of **CHANGING THE QUALITY AND QUANTITY** of the galvanic current, and for the very good construction of Galvano-Caustic Apparatus.

DR. ERNST FLEISCHL,
(*Signature of the Judge.*)

(*Approval of the Group of Judges.*)

W. ROTH, M. D., Surg.-Gen., Saxony, German Army.
J. H. THOMPSON, A. M., M. D.
C. B. WHITE, M. D.

A True Copy of the Record,

FRANCIS A. WALKER,
Chief of the Bureau of Awards.

Given by Authority of the United States Centennial Commission,

J. R. HAWLEY, President.
A. T. GOSHORN, Director-General.
J. L. CAMPBELL, Secretary."

NOTICE.

We have granted no License to any Manufacturer.

All the Metallic parts of our Machines and Appliances are finely Nickel-plated.

"MAINTAINED SUPERIORITY."

Copy of the Diploma awarded by the American Institute in the Fall of 1876.

Also, highest awards wherever exhibited in competition, which is proof of the superior qualities and combinations of currents produced by our apparatus, as well as the simplicity of operation.

COPY OF THE JUDGES' REPORT

IN

DEPARTMENT III, GROUP 5, DIVISION B,

AT THE

46TH EXHIBITION OF THE AMERICAN INSTITUTE, HELD IN THE CITY OF NEW YORK, OCTOBER AND NOVEMBER 1877.

No. 729.—ELECTRO-MEDICAL APPARATUS.—JEROME KIDDER, M.D. Kidder's Electro-Medical Apparatus (in general), to which was awarded in '75, the Gold Medal of Progress, retains at this date its superior qualities for electro-therapeutical purposes, and we AGAIN RECOMMEND THAT THE DIPLOMA FOR MAINTAINED SUPERIORITY be awarded him. Especial mention should, however, be made of an exceedingly compact Faradic apparatus, which Dr. Kidder has devised during the past year. The apparatus is constructed, so far as relates to the motive powers, after the pattern of Gaiffe's celebrated machine, but the helix and rheotome are peculiar to the manufacturer's larger batteries. The merit of this apparatus consists in its ingenious combination of old and new ideas, resulting in the construction of an instrument which for its size gives a current (in strength and variations of quality), superior to any other now in use. We recommend that to this little apparatus, be awarded the medal of superiority.

GALVANO-CAUSTIC AND GALVANIC APPARATUS.—The merits of the galvano-caustic apparatus were fully pointed out in the report of '76. This instrument is substantially the same in construction and thermic power, now as then, but after a more extended test of its merits, and a better knowledge of other forms of caustic batteries, we agree that the one under consideration is entitled to the MEDAL OF SUPERIORITY. Concerning the constant current batteries, nothing can be said further than was given in the report of last year.

☞ Diploma for Maintained Superiority.—For Electro-Medical Apparatus.

☞ The Medal of Superiority.—For an exceedingly compact Faradic Apparatus.

☞ The Medal of Superiority.—For Galvano-Caustic and Galvanic Apparatus.

A true copy of the report on file.

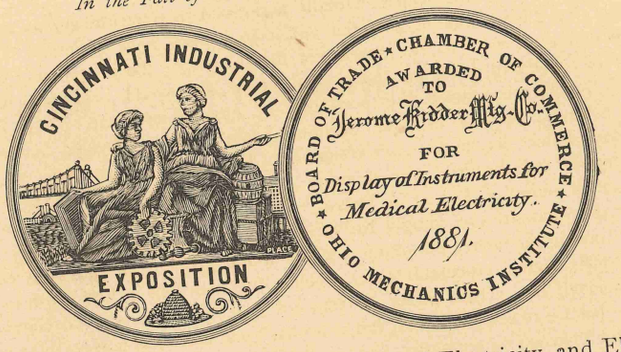
JOHN W. CHAMBERS, *Secretary*.

SILVER MEDALS

AWARDED BY THE

CINCINNATI INDUSTRIAL EXPOSITION,

In the Fall of 1881, 1882 *and* 1883 *inclusive,*



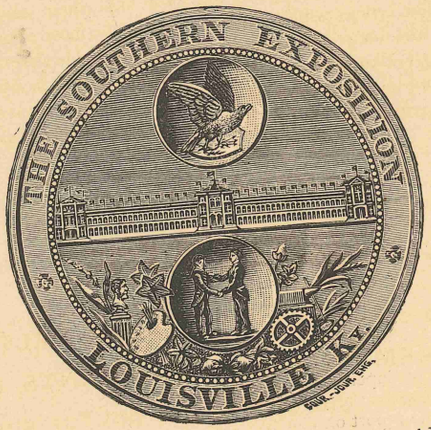
For the best display of Instruments for Medical Electricity, and Electric Machine for Medical purposes, etc.

BRONZE MEDAL

AWARDED BY

THE SOUTHERN EXPOSITION, LOUISVILLE, KY.,

Fall of 1883,



FOR THE BEST ELECTRO-MEDICAL APPARATUS.

ELECTRICAL HUMBUGS.

"The wonders which can be actually performed by electrical agents are so marvellous that it is no wonder that the public in general have unlimited faith in the powers of this force. In the presence of the telegraph, the telephone, the electric light and a dozen other successful applications, he would be a bold man who would pronounce against the possibility of any achievement. This fact does not, however, prevent us from deciding against certain obvious humbugs and swindles which are to-day too common. Electricity has its laws, as well as gravitation, and the man who proposes a scheme to which they are obviously opposed is either a fool or a knave. Some of the swindles which are now before the public are exceedingly barefaced, and yet they are wonderfully successful in drawing the money out of the pockets of the people, and the most emphatic testimonials from "respectable" clergymen. One man sells a hair brush for which is claimed all the virtues under heaven—all due to electricity. To convince the gullible portion of the public that the brush has great electrical power, those who sell it exhibit its action on a magnet, and as the brush is apparently made of non-magnetic material, the effect is supposed to be due to the electricity which is somehow stored in the brush. The fact is, however, that there is a small steel magnet concealed in the substance of the back of the brush, and it is to this that the action is due.

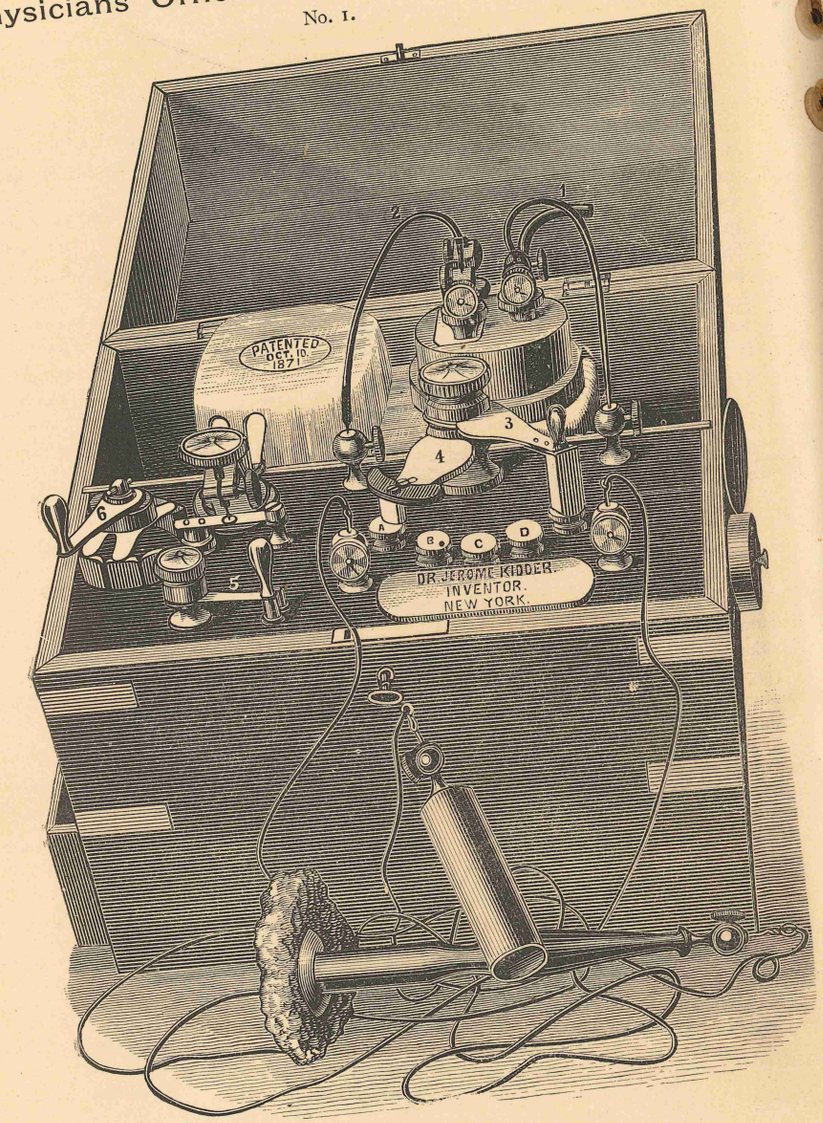
"Others present to the public what they call magnetic or electrical garments under various names. What adjectives are too strong to characterize the fraudulent claims made for these articles? That electricity is a most valuable remedial agent, when properly directed and judiciously applied, there can be no doubt. But these men know nothing either of electricity or medicine; all they want is money, and they make up for the lack of knowledge by the most unblushing assurance and the most lying claims. The articles which they sell violate the most elementary principles of natural science, and our young readers are cautioned to beware of them. The most astonishing thing is that their advertisements are admitted into professedly scientific and even into some medical papers, thus lending to them a QUASI endorsement which no respectable paper should give even in its advertising columns."—"YOUNG SCIENTIST."

BEWARE

Of all the so-called ELECTRIC PADS, BELTS, BANDS, BRUSHES, ARMADILLOS and GARMENTS, as they are made to deceive the public, and not for any Electrical effect.

Physicians' Office Electro-Medical Apparatus.

No. 1.



Physicians' Office Electro-Medical Apparatus.

No. 1.

In polished walnut case, with metallic bound corners and drawer underneath the helix; also veneered rosewood case, bound and ornamented with German silver. Size of case, 10½ inches long, 9 inches wide and 7½ inches deep.

All metallic parts are finely nickel-plated.

This machine is of large size, having four coils and ten currents.

By means of the switch 5, the second coil can be elected into the primary circuit at option.

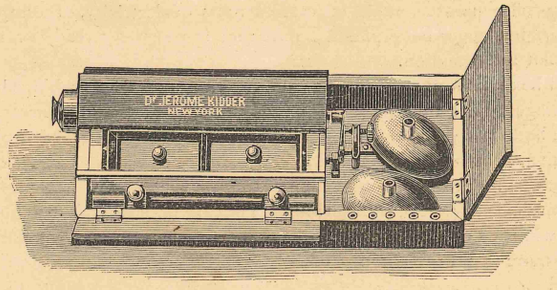
The current from any of the ten combinations is brought by the arms 3 and 4 to the two front posts or screw cups, to which the conductors are attached. By moving lever 6 to the right or left, the currents are momentarily reversed in their direction, and the pole that feels the strongest by changing when in the hands is always the negative.

With each apparatus we supply one pair conductors, one pair handles, and one sponge electrode; also hydrostat tip battery.

Price, in walnut case.....$50.00
Price, in veneered rosewood case..... 57.00

To those desiring the open battery, we would state that we furnish two open batteries, glass jars of which are 5 inches deep and 3⅝ inches in diameter, at the same price as charged for machine complete, with tip form of Battery as per cut.

Pocket Induction Apparatus.

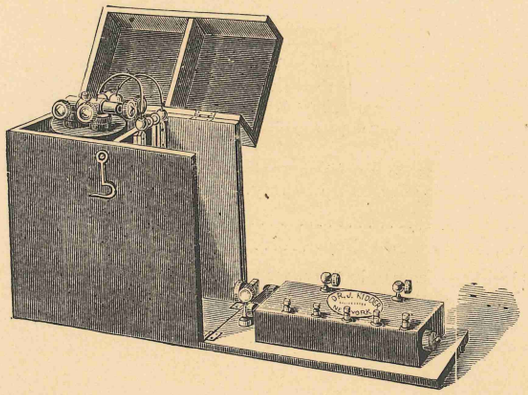


A superior Pocket Induction (Faradaic) Apparatus, having very expensive coils, so as to get the desired ranges in the qualities of currents in a very small space. It operates by means of a very little bisulphate of mercury, gives very strong power, and is more satisfactory in its operation than any other pocket apparatus made in any country. (See award by the American Institute, elsewhere in this catalogue.) Two insulated handles, two metallic handles, two sponge clasps and silk conductors accompany each apparatus.

Price, with three coils and six different qualities of currents.....$20.00
Price, with four coils and ten different qualities of currents..... 24.00

Physicians' Visiting Apparatus.

No. 2.



Is a four-coil apparatus, producing ten currents of electricity, of compact form, with an upright stopper battery, and a form that is constantly ready for use, many weeks without any attention.

The coil-box stands upright in one end of the case where it is hinged. Underneath the hinges that fasten the coil-box to the case, are springs so arranged as to connect the battery to operate the coils when the coil-box is turned down to a horizontal position, as seen in the figure. If ever desired, the coil-box can be detached from the case and operated by connecting a battery to the two screw cups, or binding posts, on the back part of the machine. The case or box is about 6 inches long, 3½ inches wide and 6 inches deep, and has a metallic handle on the lid for carrying.

It costs more to put the qualities of the ten currents in a small apparatus than in a large one.

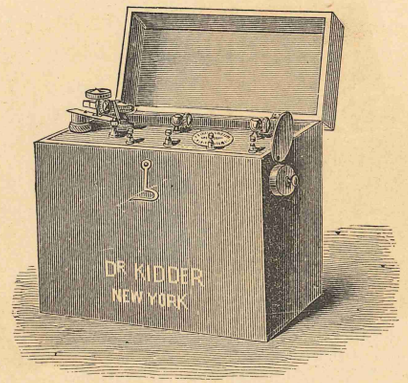
With this form of apparatus we furnish one upright stopper battery, in jar 2½ inches square, and about 5 inches deep ; one pair of conductors, one pair of metallic cylinders for the hand, and one sponge electrode.

Price, in walnut case.....$27.00
Price, in veneered rosewood case..... 32.00

All metallic parts finely nickel-plated.

Physicians' Visiting Apparatus.

No. 3.



Is another form designed for physicians' visiting use, but the helix remains horizontal in the case.

It has four coils and ten currents, of the same qualities as those of Apparatus No. 2. In polished walnut case, 7⅜ inches long, 6⅛ inches wide and 7¼ inches deep. With drawer underneath the helix, and an additional apartment at the left for the reception of extra electrodes. Operated by one upright stopper battery, in jar 2½ inches square, and about 5 inches deep.

We supply with this apparatus, one pair of conductors, one pair of metallic cylinders for the hand, and one sponge electrode.

If desired the apparatus is supplied with one open battery, having a cell or jar of hard rubber 4½ inches deep, 3½ long and 2½ wide.

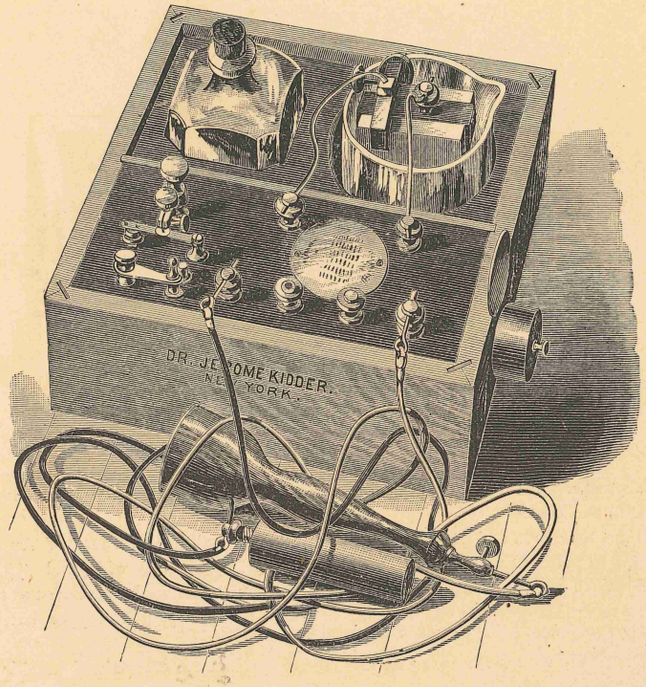
The case is arranged with an apartment at the left so as to admit of a bottle to pour the fluid from the open rubber cell, and cork it tight for carrying or for future use.

Price, in walnut case, with upright stopper battery.....$27.00
Price, in rosewood-veneered case, with upright stopper battery 32.00
Price, in walnut case, with open battery 24.00
Price, in rosewood-veneered case, with open battery 29.00

Office and Family Apparatus.

No. 4.

(*Shown without Cover.*)



No. 4 has three coils and six variations of the qualities of the currents, and is operated by one open battery, which is for weeks and months constantly ready for use, without changing the fluid, and a bottle accompanies, into which the fluid can be poured whenever desired. Polished walnut case 8¾ inches long, 8¼ wide and 7 inches deep. Switch arranged to use the second coil in the primary circuit when desired.

Price.....$20.00

We also place the No. 4 Office Apparatus in the same size case as No. 5, and supply with it a Tip Battery.

Price, complete.....$24.00

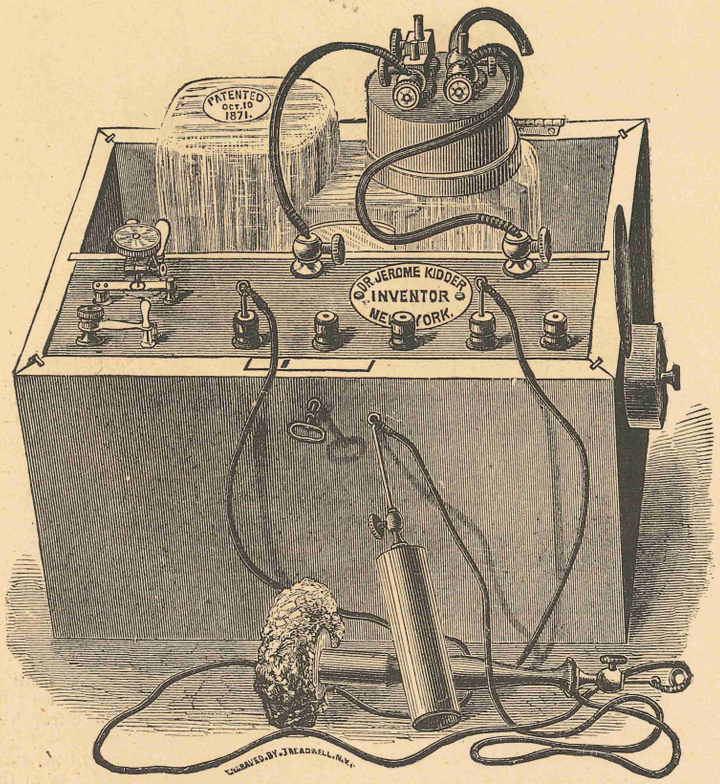
No. 4, Family Apparatus, same case and attachments as No. 4, Office, but **without switch arrangement** to use the second coil in primary circuit.

Price, complete.....$18.00

Electro-Medical Apparatus.

No. 5.

(*Cover not shown.*)



Has four differently conditioned coils, arranged to be used in various combinations, producing ten different qualities of electricity.

Constructed in polished walnut case, 9½ inches long, 8½ inches wide and 7¾ deep.

With Hydrostat Tip Battery which is always ready for use, and can be conveyed from place to place in a buggy, without danger of spilling the fluid ; also one pair of conductors, one pair of metallic cylinders and one sponge electrode.

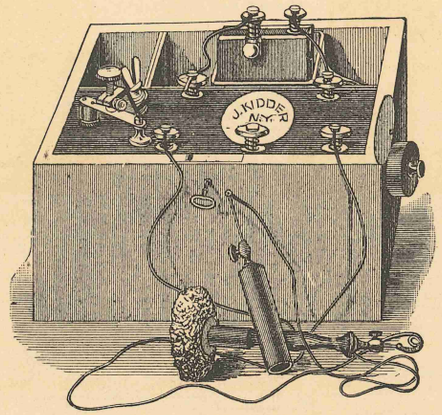
Price, complete.....$27.00

With open battery, similar to the battery operating No. 4 machine, price, 24.00

(PATENTED IN THE UNITED STATES, ENGLAND AND FRANCE.)

Family Apparatus.

No. 6.



We also make a small apparatus with two coils, and three variations in the qualities of current (see cut herewith). This is somewhat smaller than the No. 4 apparatus, but is a far better machine than any other in the market at the same price.

Polished walnut case, seven and one-half inches long, five and three quarters wide, and seven and one-half deep. It is operated by an open narrow Jar Battery, with a small glass drip cell, for resting elements into when raised out of the solution. Battery Jar measures 5¼ deep, 1¾ wide, 5 inches long at centre, and 2⅝ long at the mouth.

Complete, with cords, handles and one sponge electrode.....Price, $15.00

The Apparatus No. 4 and No. 5 are most in demand. Though presenting a good appearance, they are not made for show.

The coils of all our apparatus are constructed with reference to the medical qualities of electricity, without regard to expense, thus *differing* from all the other induction apparatus which are constructed to get up a *hurt* influence from the cheapest possible coils.

All the various parts of our Instruments are manufactured under our personal direction, and nothing but the best of material and workmanship employed in the construction of same. It is of great importance that the Rheotome (Vibration Spring) should have perfect means for controlling the length and regularity of vibration, producing a smooth and pleasant current, rather than an irregular, sharp, unpleasant sensation.

The devices whereby perfect adjustment can be made, are only found in the machines manufactured by us, as the devices are covered by letters patent.

For explanation and directions for adjusting vibration parts, see **Page 54.**

We frequently receive letters from physicians that have a large country practice, asking us to select a machine that will answer all their requirements. To such we would say that our No. 5 Tip Battery Apparatus is designed for carrying about, as the battery is a perfect hydrostat, and all the plates can be raised entirely free from the solution, and always ready for use at pleasure.

For office and family use, the No. 4 would answer very well, although the machine has not so great a range of qualities as No. 5.

Hydrostat Tip Battery.

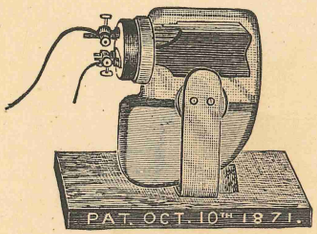


Fig. 1.

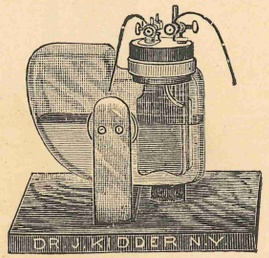


Fig. 2.

CHARGED OR UNCHARGED AT PLEASURE BY SIMPLY TIPPING THE JAR.

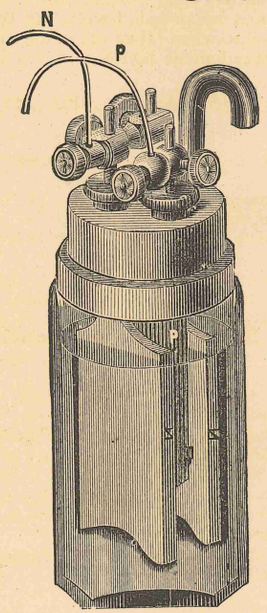
Fig. 1 shows the battery with jar tipped, and all the plates raised entirely out of the solution.

Fig. 2 shows the jar tipped, and plates immersed into the solution and battery ready for operation.

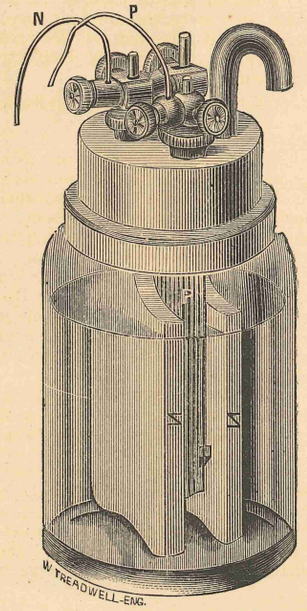
The battery is a perfect hydrostat, and can be carried about; also transported from place to place in a buggy without spilling the fluid.

Nos. 1, 4 and 5 apparatus supplied with this form of battery.

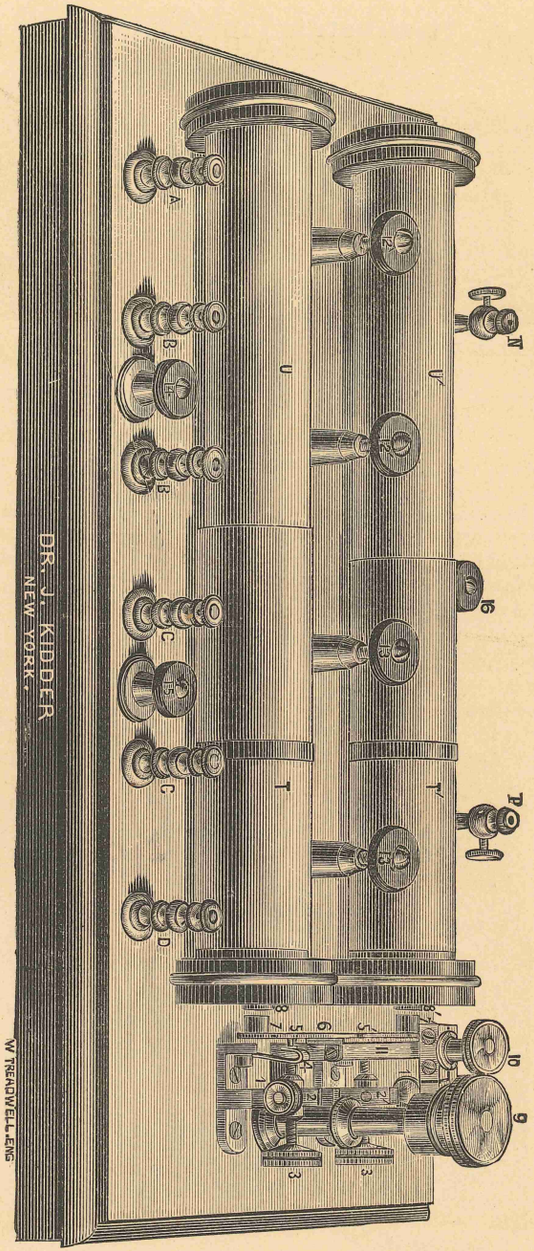
Smee's Elements.



Smee's Elements, suspended from rubber stopper in square jar, 2½ inches in diameter, $4.00.



Smee's Elements, suspended from rubber stopper in round jar, 3¼ inches in diameter, $5.00.



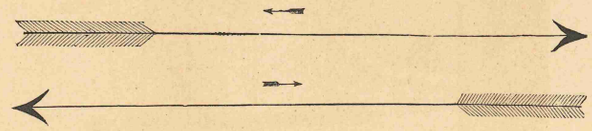
EQUAL ALTERNATING CURRENT APPARATUS.

It is well-known, or should be, that the INITIAL CURRENT or the so-called alternating induced current which has in some instances been called "to and fro" is very weak—not perceptible to the sensation under ordinary circumstances—while the TERMINAL CURRENT produces muscular contractions, etc. These two may be represented by the large and small arrows, pointing in different directions, thus:

The fact that the INITIAL induced current is comparatively so weak, has been noticed by various writers; AND IT CAN BE PROVED by controlling the vibrating armature with the thumb and finger, so that we may know when the circuit is closed and when it is broken, the electrodes being in the hands.

THE CAUSE OF THIS is that the initial current is produced when the vibrating spring touches the point, and that the primary coil thus metallically closed receives the induced influence within itself instead of the human body receiving it, which is, compared to the metals, a very poor conductor. But when the primary coil is opened by the vibrating spring, there is then no metallically closed coil to receive the terminal induced current, which is in the other direction, and the human body receives it and it is varied in quality (as noticed in other pages of this work) according to the physical condition of the helix in which it is received.

DR. KIDDER patented in 1866 an extra apparatus, entirely unique, by which EQUAL alternating currents are produced. It is accomplished by means of TWO SYSTEMS of helices, their circuits ALTERNATELY being closed and opened by means of a double-armed vibrating arrangement; and the currents are properly represented thus:

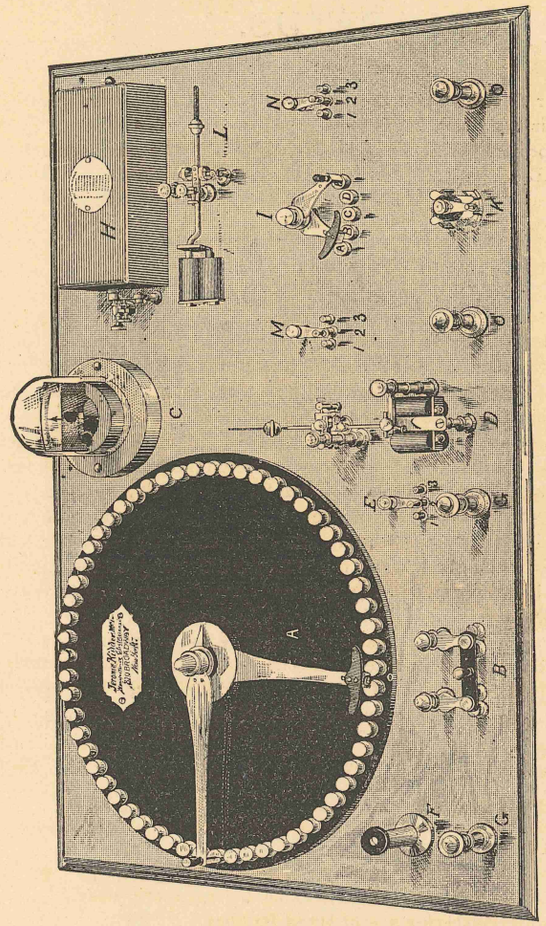


Currents of equal power succeed each other in opposite directions; also, the power of each may be varied at pleasure. This apparatus has also many different qualities of currents. The same quality of current showing light to the eye, shows more light when equal alternating than even the negative does when the terminal currents are all turned in one direction, which may be done simply by moving a small knob.

SECURED BY PATENT IN 1866.

Price of Helices, with Nickel-plated Metallic Works, from $75.00 to $100.00.

Stationary and Cabinet Stand Mechanism.



Constructed in a variety of forms, and finished to suit the physician's office.

On the cut herewith :

A.—Represents a large Compound Circle Switch, for electing or cutting out of the circuit any cell, or number of cells, in any part of the circuit by simply moving the arms.

B. — Polarity Changer.

C.—Galvanoscope.

D. — Automatic Circuit Breaker (Interrupter), constructed so as to regulate the time between interruptions, producing slow, also rapid vibrations.

E.—Switch, controlling the galvanic current.

F.—Circuit Button, for cutting out the galvanic circuit.

GG.—Galvanic Current Conducting Posts.

H.—Faradaic Coil, protected by a case or cover of wood, polished rubber, or metal.

I.—Circle Switch, for electing the various coils producing the different qualities of currents.

K.—Pole Changer, for Faradaic current.

L.—Slow Interrupter, for Faradaic currents.

M.—Switch, whereby the second coil is elected into the primary circuit.

N.—Switch, governing the vibrators of Faradaic coils.

OO.—Conducting Posts, for Faradaic currents.

Galvanic Batteries.

PRIMARY CELL BATTERY.

(*Shown without cover.*)

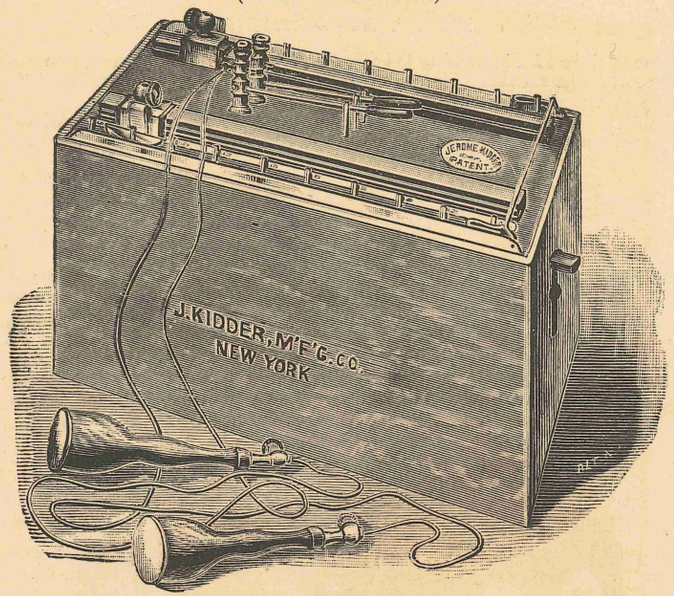


FIG. A.

With patented improved attachments for electing various cells without interrupting the circuit when the slide is moved, a very convenient arrrangement for many cases.

By moving one of the levers, the current is alternately closed and interrupted. Also, the current can be thrown rapidly and alternately in opposite directions. These arrangements add a value to these batteries not possessed by any other manufacture.

Always constructed in polished walnut cases unless otherwise ordered.

Each cell, of all our galvanic batteries, measures 2⅛ inches long, 1⅜ inches wide, and 4½ inches deep.

Zinc Plates. Each measures 5¼ inches long and 1½ inches wide.

Carbon Plates. Each measures 5¼ inches long and 1½ inches wide.

All cells in Galvanic Batteries are of Hard Rubber.

12 Cell Battery.	Case, 10½ inches long, 6¼ inches wide, and 12 inches deep.	
	Price with extra attachments as per illustration	$26 00
	Price in plain form	20 00
18 Cell Battery.	Case, 14½ inches long, 6¼ inches wide, and 12 inches deep.	
	Price with extra attachments as per illustration	$36 00
	Price in plain form	30 00
24 Cell Battery.	Case, 18⅝ inches long 6¼ inches wide, and 12 inches deep.	
	Price with extra attachments as per illustration	$48 00
	Price in plain form	42 00

The above prices include, with each Battery, two silk conducting cords and two sponge electrodes.

Batteries consisting of 32 and 36 or more cells, more especially adapted for Hospital uses, varying in their prices according to finish, kept on hand and also made to order.

EXTRA ATTACHMENTS.

Price of slides, for increasing the number of cells, without interruption . . $3 00
Price of levers for rapidly reversing and interrupting the current, also for small springs to cut out of the circuit cells at the right 3 00
Should either of the above attachments be desired with a plain form of battery, add to the price of plain form, the price of such attachments selected.

Directions for the Galvanic Batteries.

ELEMENTS.

Place the elements in their places in the machine box ; starting with a single carbon plate, having its lower end dip into the first cell at the front, left hand end of machine box. Next to the single carbon, place a double element, placing the zinc plate so it will hang next to, and into the same first cell as single carbon plate. The carbon of this double element place so that the lower end will dip into the second cell from the front left-hand end, and continue throughout the series. The object is to have the zinc and carbon plates of the same double element dip into separate, but adjoining cells ; as shown in illustration, Fig. B.

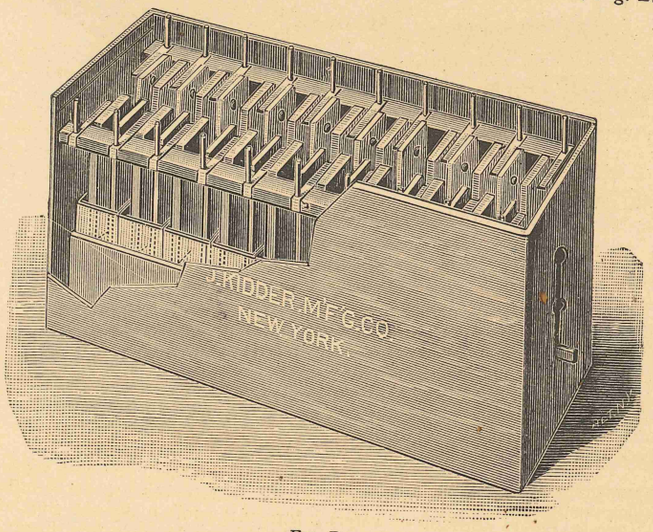


Fig. B.

CHARGING BATTERIES.

Remove the elements and place into each cell: solution (see directions) to within 1¼ inches from the top of cell. Lower the tray containing cells, replace elements as directed above, and place the polished stand containing slides, etc., over elements as shown in illustration, Fig. A.

CONNECTING WIRE.

Place the wire (⌐————⌐) at the right-hand end in the two holes of the metallic strips, to unite the front and back row of elements ; see illustration, Fig. A.

This wire is not to be removed, except for purposes of getting to the cells or elements. The metallic strips above mentioned extend along the front and back at the outside of each row of poles.

The two small springs (⊂⊃) are to be placed between the two opposite end poles at the right and the metallic strips to make complete connection. Then to leave out any number of cells at the right, remove these springs to the other poles further toward the left, as desired.

CURRENT REVERSER.

Place the conducting cords in the two cord-posts, combined with the lever supports; then, when the two levers are placed so that the one presses against the front and the other against the middle pin, the cord in the cord-post at the front will be positive, and the one in the back negative.

If these levers be carried over so as to press against the middle and back pins, the direction of the current will be reversed.

TRAY CONTAINING CELLS.

When ready for use, raise the tray containing the cells by means of the bars projecting from each end of the machine box, and turn them half around in the enlarged recesses to sustain the tray. When not in use, be sure to lower the cells again to the bottom to remove the elements from the solution.

SLIDES.

To elect any number of cells in the battery, move the slides along toward the left, and you will then use all the cells in the circuit that are between them (the slides) and the small springs (⊂⊃) at the right.

By placing the conducting cords in the two small screw cups that are on the slides, you will use the current directly from the cells, and the levers to change direction will not govern the current. In the latter case, the front is positive and the back negative.

THE SOLUTION.

The solution for the *carbon* and *zinc* elements, when both are immersed in the same solution, is made as follows :

To one and one-half pounds of bichromate of potash add one quart of hot water, in a well-glazed porcelain vessel, and stir it well. After ten minutes add four quarts of cold water and one quart of sulphuric acid. Stir it occasionally until all is dissolved, and then add water to double the bulk of the fluid.

By dissolving two drachms of bisulphate of mercury to the pint of solution (before adulteration by addition of water), it will amalgamate the zinc plates and preserve them from rapid decomposition.

HOW TO AMALGAMATE THE ZINCS WHEN REQUIRED.

To amalgamate the zincs—first, nearly fill one of the small jars with water and about one-twelfth part of sulphuric acid, stirred to mix well (or the solution as above formula before addition of water). Into this solution dip the zinc, and if more convenient the carbon also (as they should not be detached from their metallic support). After a few moments, when the surface is properly prepared, remove the element or elements from the solution, and rub quicksilver on both sides of the zinc till it is thoroughly amalgamated. For this purpose use another strip of zinc, previously amalgamated at the end used.

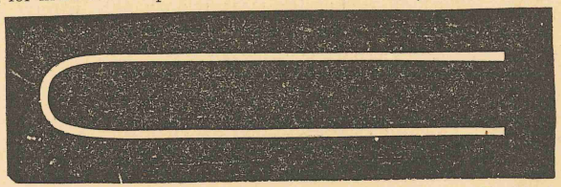
The zinc plates should always be amalgamated, before using, if the battery has not been in use for several months.

Galvano-Cautery Apparatus.

These Galvano-Cautery Batteries are unequalled as to their efficiency and convenience of operation.

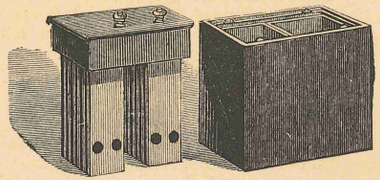
The elements are made movable horizontally in their relation to the fluid of the cells, so as to substitute, continuously, battery fluid which has recovered its allotropic power from having been released from action.

One of these forms, consisting only of two cells, each 3¼ inches long, 2½ inches wide and 4½ inches deep, will retain a platinum wire, No. 19, at a white heat, constantly, for more than a quarter of an hour. (See cut.)



Small and Powerful Galvano-Cautery Battery.

PATENTED 1876.



The price of this kind of battery, constructed to have the highest power for the size, is.....$50.00

Same size of battery, but of cheaper construction, for loop and minor operations, price..... 25.00

These batteries are also put up in a case so constructed as to suspend the elements over the cells. Also to immerse any desired amount of surface of elements to the action of the fluid. Also an apartment, with bottle, so that a charge of fluid can be carried in same case with battery.

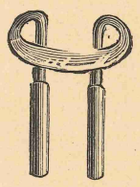
Price for above arrangement.....$5.00 extra.

We have perfected instruments that will sufficiently withstand the heat of these powerful batteries, which we warrant to be superior to any similar batteries yet constructed.

Platinum Cutters and Burners,

TO BE USED WITH GALVANO-CAUTERY APPARATUS.

No. 56.



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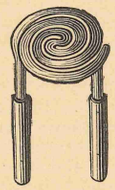

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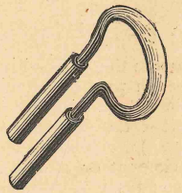
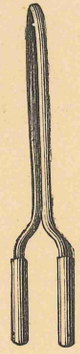


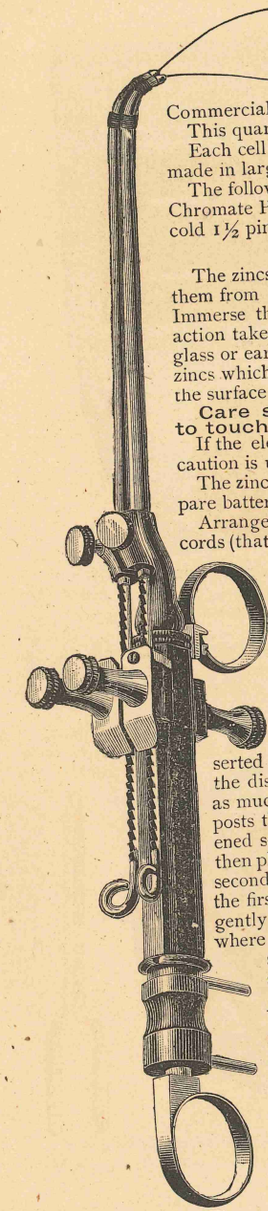
No. 60.

For various forms send for list of extra appliances.



No. 55.

Directions for Galvano-Cautery Battery.



SOLUTION.

Is composed of Bi-Chromate Potassa, Sulphuric Acid and water. To two ounces of Bi-Chromate Potassa, dissolved in 15 ounces boiling water, add when cold 6 ounces Commercial Sulphuric Acid.

This quantity is sufficient to charge the two-cell apparatus.

Each cell contains about 11 fluid ounces. This solution can be made in large quantities and put away (well sealed) for future use.

The following formula will make one gallon :—16 ounces Bi-Chromate Potassa, dissolved in 6½ pints boiling water; add when cold 1½ pints Commercial Sulphuric Acid.

ZINCS.

The zincs will occasionally require re-amalgamating, to protect them from rapid decomposition. This can be done as follows :—Immerse the elements into the solution for a minute or two, until action takes place; then place into a saucer or shallow vessel of glass or earthenware, sufficient mercury to touch the lower ends of zincs which will absorb the mercury and cause it to spread over the surface of the zincs exposed to the action of the solution.

Care should be taken not to allow the Mercury to touch the Platina Plates.

If the elements are composed of zinc and carbon the latter precaution is unnecessary as the mercury will not adhere to carbon.

The zincs are thoroughly amalgamated before shipping. To prepare battery for use, fill the hard rubber cells within 1¾ ins. of top.

Arrange the elements from the suspending part, and connect the cords (that lead to the electrode) to the two connecting posts on top and when all connections are made the elements can be lowered into the solution. The form of battery (as shown in cut) has not the suspending attachment, and all connections should be made before the elements are immersed into the solution.

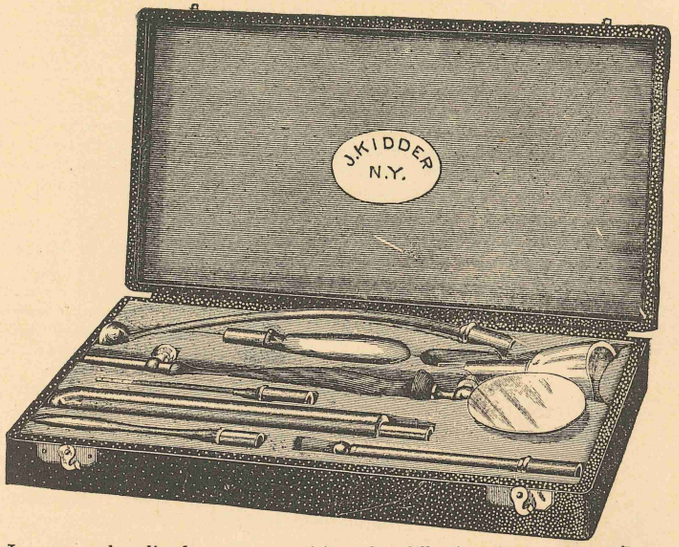
TO ADJUST LOOP IN HANDLE.

Withdraw the two ratchet rods from the extending tubes, then pass the platina wire through the tubes and fasten the ends of wire to the rods. If the two rods are withdrawn and wire attached to same, then the rods inserted into tubes as far as possible, the loop will be as large as the distance the rods are inserted. To increase the loop, allow as much wire as you desire before fastening to rods. The screw-posts that bind the springs upon ratchet rods, should be tightened so that springs press well against rods, to prevent slipping; then place the thumb in ring at rear end of handle, and insert the second finger into ring at front end near the tubes, and by placing the first finger against the single screw-post underneath and gently closing the finger you will draw the slide toward the part where cords are attached, diminishing the size of loop and at same time close the circuit with thumb. As soon as the pressure is released, the circuit is broken and all action ceases.

To further diminish the size of loop, after the slide has been drawn the full length of slot, draw one or both of the ratchet rods in same direction as slide. You can by this arrangement draw a large loop close to the ends of tubes.

The cords are attached to the two connecting posts, as seen in cut, near the thumbpiece of handle. For burners, knives, &c., remove the rods and tubes shown in cut, and substitute two tubes that accompany each handle. The burner should first be secured into the tubes, and they in turn inserted into handle and held firm by means of the binding screws. To heat burners press on handle to close circuit is described. The small insulator should at all times be slid over tubes, to prevent their touching and interfering with current. For further list of Instruments, see list of Extra Appliances, for Electro-Therapeutic uses, mailed on application.

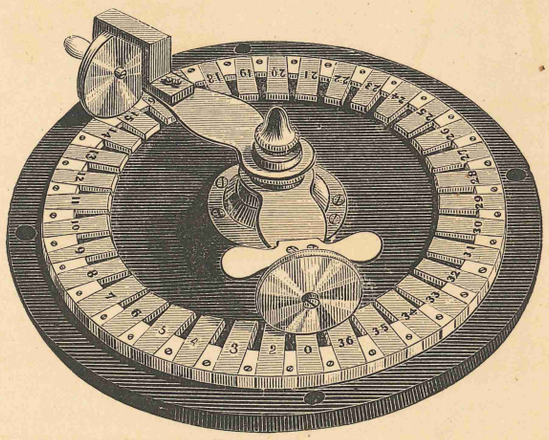
Case of Instruments.



In neat velvet-lined case, comprising the following instruments: Eye, ear, spatula (tongue), brush, rectal, vaginal, uterine, and sponge clasp. All to fit universal handle. Price, $15.00.

Compound Circle Switch,

FOR ELECTING CONSECUTIVE NUMBERS OF BATTERIES.

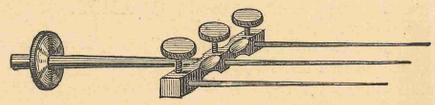


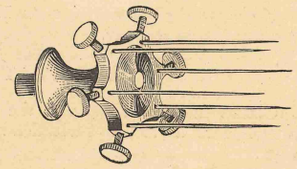
This differs from all other current switch cell electors in its adaptation to throw out of the circuit any number at the beginning, as well as at the end of the series.

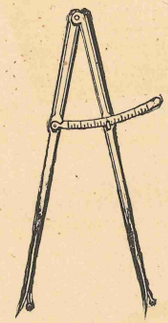
COVERED BY LETTERS PATENT.

VARIOUS FORMS OF

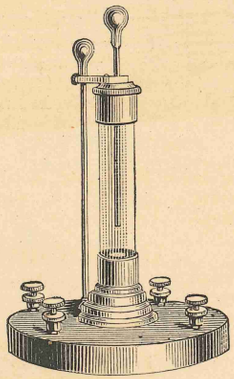
Holders of Needles for Electrolysis.







Carroll's Aesthesiometer.



Water Rheostat.

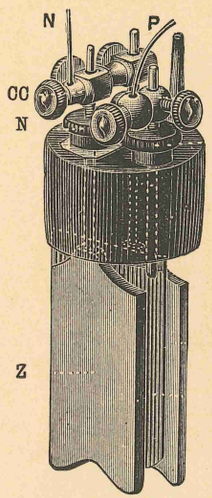
Vaginal Electrode.

Fasten sponge over ball end and draw sponge into hard rubber cylinder. Then insert cylinder and press the sponge forward to locate in any desired place.

With this form the unpleasant sensation of inserting rough sponge is abolished.

Price.....$2.00.

Instruments of any style made to order at short notice and of best mechanical workmanship.



Directions for Removing Plates from all our Forms of Stopper Batteries.

CLAMPS.

Remove the clamps C, CC, from the rods projecting above the stopper.

VULCANITE NUTS.

Unscrew the vulcanite nuts N so that plates can be removed from stopper.

ZINC PLATES.

Clamp the lower ends of the zinc plates Z Z (one at a time) into a vice, and withdraw the stopper from the rods.

PLATINA PLATE.

The platina plate P should be clamped into a vice *by the rod where it is riveted to the corrugated part*; then withdraw the stopper from the rod.

Directions for Inserting New Plates into Stopper.

PLATINA PLATE.

Always insert the platina plate P first, by clamping it into a vice, by the rod where it is attached; pressing the stopper on to the rod, replacing the vulcanite nut N so as to press firmly upon top of stopper.

ZINC PLATES.

The rods attached to zinc plates Z can be pressed through the stopper (in their respective places) by the hands.

STAMPED PLATE.

The small stamped plate is placed on the *upper side of the stopper*, with the ZINC RODS ONLY passing through the holes in the plate.

VULCANITE NUTS.

Screw on the rods, the vulcanite nuts N to hold all firmly together.
By turning down more or less firmly the vulcanite nuts upon the flexible rubber stopper, its breadth can be adjusted to fit somewhat varied larger or smaller-mouthed jars.

CLAMPS.

Replace the clamps C, CC, placing the double clamp CC on the two zinc rods, with the binding screws towards the circumference of the stopper, as shown in the illustration. The single clamp C place on the platina rod with the binding screw, as shown in illustration.

Directions for Attaching Sponge to Electrode.

Unscrew the small metallic piece or screw cup at the small end of electrode, and remove the wood handle from rod. Select a medium size flat sponge, and immerse it into a bowl of water until thoroughly saturated; then press out water with the hands and lay sponge upon a flat surface, placing the metallic disc upon the sponge, as illustrated in Fig. 1.

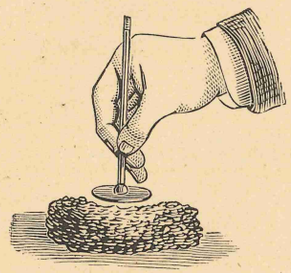


Fig. 1.

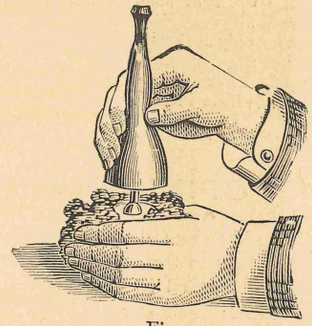


Fig. 2.

Then press the disc down firmly upon sponge with the right hand, holding all in position, and with the left hand fold the edges of the sponge over the disc towards the rod; hold same firmly with the left hand, as shown in Fig. 2, and remove right hand. The object is to entirely surround the metallic disc with sponge.

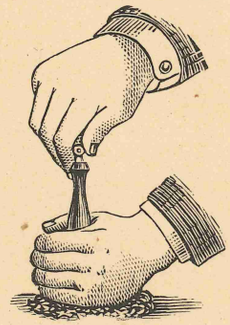


Fig. 3.

While holding all together, as described, replace wood handle with the right hand, Fig. 2, so as to cover edge of sponge close to rod; replace screw cup, to bind all parts together, as shown in Fig. 3.

The heavy metallic parts of our apparatus we pack underneath the helix, to avoid damage to goods during transportation. If, upon receipt of apparatus, you should fail to find the elements to the jar, please examine under the helix before writing to us, thereby saving you time and annoyance.

These certificates of cures are published, not for the information of those intelligent physicians in New York and elsewhere who already know what the proper qualities of electricity can accomplish, but for those physicians who have not given attention to the therapeutic use of electricity.

All the advanced scientific practitioners use and recommend Dr. Kidder's improved apparatuses, because of the genuine modifications of electricity developed on the different conditioned coils, and the means which command their perfect operation.

The only authorized testimonial from Prof. Doremus, shows the decided superiority of these apparatuses.

☞ Be careful to examine the date and to whom addressed of all pretended testimonials from Prof. Doremus.

OPINION OF PROF. DOREMUS.

The following testimonial from R. OGDEN DOREMUS, M. D., Professor Chemistry and Physics in the N. Y. City College, and Professor Chemistry and Toxicology, Bellevue Hospital Medical College, refers to the superior merits of Dr. Kidder's Apparatus:

"COLLEGE OF THE CITY OF NEW YORK,
"Cor. Lexington Avenue and Twenty-third Street,
"NEW YORK, August 9, 1871.

"DR. JEROME KIDDER:

"*Dear Sir*—Within the past few weeks I have carefully examined the construction of several forms of your Electro-Magnetic Machines.

"I find that they differ in philosophical principles from any I have before investigated, and that they possess, in addition, many mechanical improvements.

"By your ingenious modifications and combinations * * * * helices of wires of different lengths and thickness, I find that the electric effects are materially altered in a manner not accomplished by any other machines.

"These variations I have tested by galvano-metric, galvano-thermic, and other scientific instruments.

"I have also experienced the varied effects produced upon the human system in my own person, and have witnessed the same in others, on applying the currents of electricity from the various coils, and through conductors of graded lengths and sizes.

"Thus the eye can be stimulated to appreciate various amounts of light without pain; or slight pain may be experienced without so exciting the organ as to perceive light. By changing the flow of the mysterious agent, its influence may be felt at the wrist, in the forearm, or higher up near the shoulder, in addition to all the variations of frequency, direction and power usually provided for in electro-magnetic machines.

"I confess I was surprised at the agreeable nature of the electric current. Most persons dislike the peculiar sensations experienced from the ordinary machines, and, after a first trial, decline a repetition of it. All such would appreciate not only the bearable but the pleasant effects produced by your arrangement.

"Thus you have placed in the hands of the skilled physician most valuable modifications of a power which is destined to solve many of the mysteries of our organization, and to relieve many of the ills of life.

"In conclusion, I would state that your method of varying the *Primary* as well as the *Induced* currents surpasses all other devices I have studied, as tested by scientific instruments and by physiological effects.

"I most heartily commend its use to my medical brethren as the instrument for research in this attractive field of medical inquiry.

"I have the honor to remain,
"Your obedient servant,
"R. OGDEN DOREMUS, M. D."

VALENTINE MOTT, M. D., for many years Professor in the New York Medical University, until his death, in the summer of 1865, recognized the superior merits of this apparatus by the following testimonial:

"Electricity, as a remedial agent, is invested with increased interest and importance, as the apparatus employed is more perfectly adapted to such use. Dr. Jerome Kidder, of this city, has labored successfully to produce a really superior Electro-Medical Apparatus. The machine which he has brought forward, secured by Letters Patent of the United States, has six currents, having each different qualities, as he has fully proved by magnetic, chemical, and physiological tests, whereby they plainly exhibit their difference of magnetism, galvanism, and faradayism—the latter modified by tension, so as to be concentrative or diffusive; and it is perfectly controlled in power. These features, and also improvements to command their perfect operation, constitute them among the useful auxiliaries in therapeutic practice."

"Dr. KIDDER has undoubtedly succeeded in producing the best and most appropriate machines of the kind. Too much praise cannot be given to them, principally by reason of the various qualities of the currents they produce, the usefulness of which can only be doubted by persons unacquainted with the theory and practical uses of electricity as a remedial agent.

"P. H. VAN DER WEYDE,
"Late Prof. of Chemistry, New York Medical College, Cooper Union, and Girard College, Philadelphia."

BROWNSVILLE, TENN., May 29, 1883.

JEROME KIDDER M'F'G CO.

Dear Sirs:—We have given your Electro-Therapeutic Apparatus a thorough trial, and consider it superior in every respect to other machines in general use. Judiciously used, it constitutes one of the grandest Therapeutic Agents, in a certain class of diseases, the world has ever known. * * *

Very respectfully,
DRS. J. R. & J. T. ALLEN.

1110 CHAMBERS ST., ST. LOUIS, MO., Dec. 30, 1883.

JEROME KIDDER M'F'G CO.

Gentlemen:—It always gives me pleasure to recommend your instruments, for they have always given me entire satisfaction. * * *

Most respectfully,
GEO. C. PITZER, M. D.,
Prof. of the Theory and Practice of Medicine in the American Med. Coll. of St. Louis, and Clinical Lecturer at City Hospital.

MACON, MO., Jan. 30, 1884.

JEROME KIDDER M'F'G CO., 820 Broadway, N. Y.

Dear Sirs:—Will you please send me by mail one corrugated plate. I need it immediately. The instrument is of great benefit to me in my practice, having cured a great many patients by using the battery that could not be cured by the use of remedial agents, but I have succeeded in every case by the use of the battery. I would not be without it for any money while engaged in the practice of medicine. Please send the plate at once. Direct,

JOHN W. PICKETT, M. D.,
Macon City, Macon Co., Mo.

LANSING, MICH., Feb. 22, 1884.

JEROME KIDDER M'F'G CO.

Dear Sirs:—Enclosed I send you a draft on N. Y. for the amount of your account for Battery, etc. It is perfectly beautiful, and the parties I got it for are well satisfied with it. I am trying to induce another party to get one before I leave. With many thanks, Yours faithfully,

R. W. NELSON, M. D.

NORRISTOWN, PENN., Aug. 15th, 1881.

JEROME KIDDER M'F'G CO.

Gentlemen:—Thinking that the results of a long continued use of Dr. Jerome Kidder's Electro-Medical Apparatus may be of service to you I render the following:

About 16 years ago I was stricken with Paralysis of the Brain, accompanied by a general depression of the nervous and muscular functions, resulting mainly from overwork, both mental and physical.

For two years I used the remedial agents of the medical fraternity, being blistered and fed on iron and other officinal preparations, but with indifferent results. I then placed myself under Electrical treatment by Dr. Beckwith, of Phil. (now deceased), who, in ten applications brought me to such a state as to enable me to travel and make the succeeding applications myself.

Dr. Beckwith furnished me with one of Dr. Kidder's No. 4 Batteries, which I used with comfort and advantage for some years, after which I obtained from Dr. Kidder a Tip Battery, one of which I always mean to keep about the house.

I do not hesitate to say that I OWE MY PRESENT EXISTENCE TO THE PERSISTENT USE OF ELECTRICITY. The two years spent in trying drugs allowed the brain difficulty to become CHRONIC, and relief had to be obtained by gradations. I am now as fully recovered as I ever expect to be, having reached 57 years, a time when the down grade of life is generally found to have been reached.

I have used the Battery for about all ills to which I have been subject, with marked success; and have frequently afforded relief to friends who were suffering from Rheumatism, Neuralgia, &c.

One cure of Neuralgia in the Temples was cured by half an hour's application of the A. D. current—negative to the feet, and positive in the left hand of operator, while he bathed the temples alternately with his right hand. This case had been of considerable duration, and fly-blisters had been applied to the temples without benefit. Four years have since elapsed and no return of Neuralgia.

A case of Ganglion below the knee, which became larger than half a hen's egg, was dispelled in 20 minutes application of the same current, similarly applied, except that the positive was passed over the knee by means of the insulated sponge holder.

For my own use I keep the battery at the head of my bed, and call upon its service after retiring, mainly to induce sleep, dispel indigestion, relieve affections of the kidneys, bladder, &c. The recumbent position seems best adapted, and a good night's rest almost always follows the application after retiring.

From personal experience on myself and others, I am satisfied that the range of beneficial results claimed by Dr. Kidder is below rather than above what the instruments will produce when judiciously handled; I believe the use of Electricity as a remedial agent is yet in its infancy.

The objection that none but medical men can apply it with safety is a delusion. A few hours instructions "sown on good common-sense ground" will enable a person to use the Battery with safety and to advantage. Practice, aided by your "Exegesis" will enable a sensible person to make good use of an instrument, and applications for specific needs will come as they are needed to thoughtful persons.

Of course the Battery will not set a broken limb, or replace a defunct organ, but it will restore a vitality unlooked for which laid dormant before. There are doubtless cases where it will be necessary to "Try, try again," but, in the generality of instances, good results will be found to speedily follow a faithful application.

Profoundly thankful for the benefits I have received, I am seeking to extend to others in affliction the remedy which was so effectual in my case. The calls for Batteries for friends must have satisfied you long ere this, that Electricity was doing a good work hereabouts.

Very truly yours, &c.,

CHARLES SLEMMER,
of SLEMMER BROS., Oil Refiners.

UNADILLA, Aug. 10th, 1881.

Dear Sir:—Enclosed please find P. O. Order, and send to enclosed address, one No. 4 Hydrostat Tip Battery. * * * Send immediately, as I want to set it up before I leave here.

I have undertaken a serious case in this village, and it is creating considerable interest and some excitement.

A lady said to be dying by her attending physician (the best in the place), a clear case of Lung Consumption, is not only being kept alive under my wife's administration of Electrical Treatment with my No. 5 Battery, but is really and unquestionably improving. Her appetite has returned, insomnia is conquered, and she sleeps comfortably at night without the accustomed opiates which never gave her when in full doses more than 1½ hours sleep during the night. * * *

If we succeed even as well as we have thus far, for two weeks longer, Electricity as a remedial agent will take a stride in this section of country, and make it a necessity for physicians to procure batteries.

Yours truly,

REV. JAMES S. BRADBROOK,
Unadilla, Otsego Co., N. Y.

PADUCAH, KY., Aug. 27th, 1881.

JEROME KIDDER M'F'G CO.

Gentlemen:—Enclosed please find money order which place to my credit, and send following goods * * * I am using Hoffman and Palmer's Electro-Therapeutic Bath. I have just relieved Dr. Geo. Raser of an attack of Paralysis of the entire left side of the body, including the eye; he is 68 years of age, and to-day he walks to call on his patients. I shall send in different orders this fall and winter. Hoping to hear from you soon, I am very respectfully,

WM. J. GRIEF.

COLUMBUS, OHIO, Aug. 29th, 1881.

Gentlemen:—Your battery works finely, and has proved very useful to me in two cases I had about given up. Yours,

H. D. CHAPLAIN, M.D.

GALLIPOLIS, OHIO, Oct. 5th, 1881.

JEROME KIDDER M'F'G CO.

Dear Sirs:—Send following goods: * * * The battery we purchased from you a few months since has given excellent satisfaction, and the physician who owns and uses it feels that it can be recommended and relied upon, and has used it very successfully. Very respectfully, KERR BROS.

ALLEGHENY, PA., Oct. 22d, 1881.

JEROME KIDDER M'F'G CO.

Gentlemen:—Few days ago I purchased from a certain party one of your excellent Ten-Current Tip Batteries. As there was no pamphlet with the apparatus you would oblige by sending one which could serve me as a guide how to use the different combinations, there being evidently a great difference in the Therapeutical effects of the various combinations, some giving quantity currents, others tension currents, as I tested by experiment. After all I have seen already the "Kidder" Battery still surpasses any other Electro-Magnetic Apparatus in the market in respect to prompt action, wide range of effect and pleasant smoothness of its currents. The tip arrangement is an ingenious device of the apparatus; all the parts of the armature are well and substantially made, and the coils well protected. I have been using in my practice for a number of years various makes of Electro-Magnetic Batteries, but have them all discarded for the sake of the Kidder Battery. Will you please send me latest price list of your various Electro appliances and oblige,

Respectfully yours, A. ZIEGLER, M. D.

NAPOLEON, HENRY CO., O., Oct. 14th, 1881.

JEROME KIDDER M'F'G CO.

Messrs:—Enclosed please find money order. * * * I wish to say to you that I was cured of rheumatism by the use of the battery three years ago, and did not use the battery since. I have another attack of rheumatism, and would be pleased to have you send the goods at once.

I think a great deal of your batteries, and can recommend them to all who are suffering from the effects of inflammatory rheumatism or any form of rheumatism whatever. I would not take $100 for mine if I could not get another.

Respectfully, A. F. DOVE.

AKRON, OHIO, Nov. 13th, 1881.

To Whom It May Concern:

We have for many years used the Electro-Medical apparatus supplied by the Jerome Kidder Manufacturing Company, and can testify to the superior qualities of the instruments and appliances manufactured by this firm, in producing the various modifications of Electricity so indispensable in the successful treatment of disease.

Drs. J. E. and M. A. SCANLON,
Electro-Therapeutists.

GOOD SAMARITAN HOSPITAL, JEFFERSON AVE., HEAD OF O'FALLON ST.

ATTENDING PHYSICIANS.

T. G. COMSTOCK, M. D., J. A. CAMPBELL, M. D., Oculist and Aurist. E. C. FRANKLIN, M. D..

D. R. LUYTIES, M. D., A. S. EVERETT, M. D., Resident Physician. CHARLES GUNDELACH, M. D.,

ST. LOUIS, Mo., March 9, 1882.

JEROME KIDDER M'F'G CO., NEW YORK.

Gents:—The Kidder Battery which you sent me in Dec.. 1881, I have taken to my office for my private use, and now want one exclusively for the use of the Good Samaritan Hospital. Send the Tip Battery, No. 5, same as last, also one * * *. You can refer to me personally, or to any of the staff of the Hospital, as to the merits of your Battery. We regard it as the most practical machine we have ever used, and in fact we have found it almost perfect.

Our Hospital is filled with wrecks of other batteries, and we are happy to find one which gives us no trouble.

Yours respectfully, T. G. COMSTOCK, M. D.

ST. LOUIS, MO., March 15, 1882.

JEROME KIDDER M'F'G CO., N. Y. CITY.

Gentlemen:—Please send me forthwith the following articles * * *. Enclosed find P. O. Order. * * *. Your No. 2 battery, sent me last June, has been working constantly ever since and doing excellent work. Some of my cures have been almost miraculous.

Very respectfully yours, THOS. P. DAVISON, M. D.

SHUQUALAK, MISS., March, 26, 1883.

JEROME KIDDER M'F'G CO.

Please send me two zinc plates and one platina plate complete. These plates are for one of your Electro-Medical Apparatuses, the best out. * * *.

Yours, truly, P. H. HAMILTON, M. D.

BIG RAPIDS, MECOSTA CO., MICH., March, 27, 1883.

JEROME KIDDER M'F'G CO.

Dear Sirs:—Catalogue received. Please send to my address (C. O. D.) an Electro-Medical Apparatus, No. 5, with Hydrostat Tip Battery. In 1859, through Dr. Shedd, I procured a Kidder battery, and since that failed have never been able to find one that gave any satisfaction; if you will send another as good I will be perfectly satisfied. Please forward as soon as possible.

Yours, truly,
W. S. WHITNEY, M. D.

MEMPHIS, TENN, July 6, 1884.

JEROME KIDDER M'F'G CO., 820 Broadway, New York.

Dear Sirs:—I received your letter and catalogue in due season * * * I have used your No. 5 instrument for a year and a half while in charge of the Meribah Mineral Springs and Hydro-Electro-Therapeutic Institute of Stratford, Ont., and therefore am thoroughly impressed with their virtues, in my own case especially. After suffering with sciatica for years, one application effectually relieved me.

I am yours respectfully,
Dr. C. G. B. KLOPHEL, No. 39 Poplar Street.

WASHINGTON, July 8, 1884.

JEROME KIDDER M'F'G CO., 820 Broadway, New York.

Dear Sirs:—I am still using your Batteries I have used so long. Have discarded all others in their favor.

In looking over your catalogue I concluded to have another one, No. 5(see inclosed cut). * * * I wish the Hydrostat Tip Battery, price $27.00.

Yours truly,
DR. L. S. NICHOLSON,
No. 715 Fourteenth Street, N. W., Washington, D. C.

NEWBURYPORT, MASS., July 15, 1884.

JEROME KIDDER, M'F'G CO.

Gentlemen:—I have one of your Tip Batteries, and I would like a new set of plates for the same * * * I have used the battery now about ten years and find it the most convenient of any I ever used.

Yours respectfully,
DR. J. B. M. DICKINS,
No. 8 Pleasant Street.

NEW ORLEANS, July 16, 1884.

JEROME KIDDER M'F'G CO.

Dear Sirs:—I have been using one of your Electro-Magnetic Machines. I have found the application of Electricity to the womb as a uterine motor stimulant to excel any known means to control hemorrhage in post-partum hemorrhage and in those cases where chloroform has been used. Ergot and ice will be of no avail, as the system is so relaxed that the uterus will absolutely refuse to remain contracted. In all and any case the battery acts with unfailing success. The physician can do without his thermometer and hypodermic syringe, but the enlightened M. D. must have his portable Electro-Magnetic Machine, and he will have no failure. I have never found any benefit from its application for rheumatism or paralysis, but it seems God intended it to be invented for the sole purpose of a uterine contractor. I use it in this manner: Take a sponge one inch and one-half in diameter. Attach it to one pole (insulated), and enter it into the vagina until it is near the os uteri, but not into it; then place a sponge 3 inches in diameter over the hypogastric region, and set the battery in motion, and presto! the womb contracts. I sometimes leave it in position for several hours, and in one case I applied the battery continually for eight hours.

Yours truly, etc.,
DR. R. D. FAIREX,
347 South Rampart St., New Orleans, La.

RUSHFORD, N. Y., August 2d, 1884.

JEROME KIDDER M'F'G CO.

Gentlemen:—In the month of March I became paralyzed from spinal difficulty, and was perfectly helpless for more than two months. I sent for one of your batteries, and thanks to it and you I am able to stand on my feet again, and can walk with a little assistance, and in a short time expect to be able to walk alone. The battery is a great institution. and I don't know what I would have done without it.

Very respectfully,
C. J. HARDAWAY,
Rushford, Allegany Co., N. Y.

JEROME KIDDER M'F'G CO., COMANCHE, TEXAS, Nov. 29, 1886.

Please find enclosed * * * for order this date by wire. I am now treating successfully with your No. 5 battery typhoid fever and find that electricity can be used as an antipyretic and antiphlogistic, and is superior to any agent I have been able to find in a practice of fifty years. I am using it side by side with Antipyrine in the hands of others. This day is the seventeenth of the fever and twelfth of my treatment, without a cent needed for either medicine or stimulant. I have no doubt dengue and yellow fever may be made subject to this great agent. Very respectfully,

F. T. PAINE, M. D.

MEDICAL AND SURGICAL INSTITUTE, WAGNER BLOCK, 1414 LARIMER ST.
DENVER, COL., Feb. 4, 1887.

DR. JEROME KIDDER, N. Y. CITY,

Dear Doctor:—Your Electro-Medical Aparatuses are the best, neatest, cleanest and most durable we have ever seen or used. Please give us your lowest price or send us C. O. D. zinc plates for use in your No. 5 Hydrostat Tip Battery. If we knew the price would send the money now. Please send us price list of different parts of your machines, &c. We remain,

Very truly yours, DR. H. WAGNER & CO.

THE MASSACHUSETTS MEDICAL JOURNAL,
ROBERT A. REED, Editor.
JEROME KIDDER MANUF'G CO., BOSTON, June 9, 1887.

Gentlemen:—I have one of your tip batteries which I have used for upwards of five years, and for the first time I find a repair needed. The platina plate has given out. I believe that for range, regularity and smoothness of current, and therapeutic scope your battery is unsurpassed, while for convenience it certainly has no equal. If I can insert the platina plate myself please send it and I will remit promptly. Yours very truly, ROBERT A. REID.

An Abstract from an Article by A. D. Rockwell, A. M., M. D., Professor of Electro Therapeutics in the New York Post Graduate School and Hospital, Fellow of the New York Academy of Medicine, Member of the New York Neurological Society, Etc.

Kidder's induction coils are unique in construction, and of unsurpassed efficiency in the treatment of those morbid conditions for which the faradic current is indicated. The varying qualities of current proceeding from these coils possess a differential value of no little importance, and are worthy a more careful investigation by those interested in electro-therapy than has yet been given them.

GERMANTOWN, TENN., Feb. 18, 1888.

JEROME KIDDER MANUFACTURING CO.,

Gentlemen:—The No. 5 Hydrostat Electro-Faradic apparatus has been duly received; and from the annoyance I have experienced in keeping other machines in tact, it seems that your device is but *little less* than *perfection.* Its convenience is striking, the ready and certainty of its work is marvelous. The durability, simplicity, compactness and efficiency is striking and suggestive to the needs of a busy practitioner, and above all will add, that the various currents produced in this machine can not be equaled by any machine now offered to the profession.

Yours truly, T. H. WILLIAMS, M. D.

JEROME KIDDER M'F'G CO., WALNUT, TEXAS, July 3, 1888.

Gentlemen:—Your battery No. 5 with hydrostat tip, came safe yesterday. Am pleased with its appearance and action so far as tested. I am confident it is a superior machine at the price. Very truly yours, J. H. WYSONG, M. D.,
Professor Chemistry, Galveston Medical College.

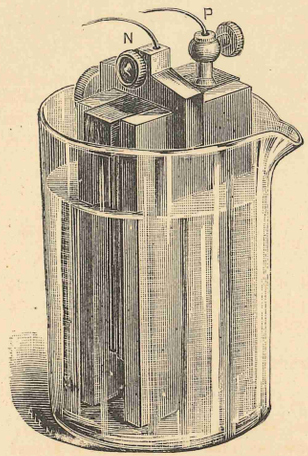
Directions for the Operation and Care of our Celebrated Faradic Apparatus.

Patented in the United States, England, and France. The Machine consists of two parts—the INSTRUMENT and the BATTERY. The INSTRUMENT consists of a helix having a combination of coils of copper wire, a magnet and its spring, and metallic posts attached to a stand.

The Battery which runs the instrument consists of two zinc plates with a thin plate of platina between them, using a solution of sulphuric acid and water.

SOLUTION.

The solution to operate our Faradic apparatus consists of about eleven parts water (soft is best) and one part common sulphuric acid. Place into the solution one teaspoonful of quicksilver. This will operate the apparatus many days without replenishing. The quicksilver is necessary to keep the zinc plates amalgamated, and protect them.

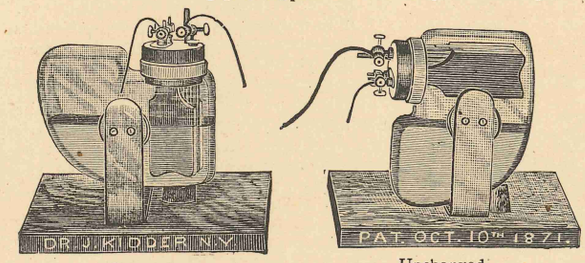


Simple form of Battery for Operating Machine.

The solution should always be made new when salt gathers on the plates *beneath its surface.* The salt must not be allowed to gather so as to form connection between the zinc and platina plates. When salt gathers on the plates, it may be readily dissolved by removing the plates from the solution, and immersing in water.

To Prepare the Open Battery.—The zincs should first be amalgamated (see directions); but this is done before shipping. Put into the cup the solution (see directions), including the quicksilver, until the surface of the solution is about one and one-half inches below the top of the painted wood. This wood should be revarnished occasionally with shellac varnish or paraffine, to protect it from moisture, which would diminish the power of the battery. *Be sure* that the metallic clamp does not touch the post attached to the painted wood.

To Prepare the Tip Battery.



Charged. Uncharged.

For the quantity of solution in jar see illustration. Place the rubber stopper, with the attached elements, in the jar, pressing it in carefully till the zincs *almost* touch the bottom, to avoid breaking the jar by forcing the zincs against the bottom, and place them so that when the jar is turned to remove the elements from the solution, the flat surface of the plates will be perpendicular, then the quicksilver will not drop from the zinc on the central plate of platina; for there should be a little quicksilver (about a teaspoonful) in the jar to touch the lower ends of the zincs and keep them amalgamated. When using too much quicksilver it is liable to get on the platina, and, to avoid which, always, also, when carrying the battery about, have the jar turned so the elements are removed from the solution.

By turning down, more or less firmly, the rubber nuts that hold the elements to the flexible rubber stopper, its breadth can be adjusted to fit somewhat varied larger or smaller mouthed jars.

The clamps for attaching conductors to the elements should be removed occasionally to clean the attachments; and when replacing these clamps be careful to place the long one on the two wires projecting from the zincs, and the short one on the wire projecting from the platina.

The solution should always be made new when salt gathers on the plates *beneath its surface.* The salt must not be allowed to gather so as to form connection between the zinc and platina plates. When salt gathers on the plates it may be readily dissolved by removing the plates from the solution, and immersing in water.

The Quicksilver Must Not Touch the Platina, but if, by accident, this should occur, evaporate it by holding the plate over a spirit (alcohol) lamp. The platina must not touch the zincs. The battery can stand in the solution a long time and be continually ready for use; having the zincs protected by quicksilver touching their lower ends whence it spreads over their surface; but it is better to turn the jar of the TIP battery, and of the OPEN battery remove the elements.

Amalgamating Zincs.

If it should be necessary to amalgamate the zincs after long disuse, before using again, take them apart, dip them into the solution in the cup for a few moments, then with a brush or rag, wound on a stick, rub quicksilver on them.

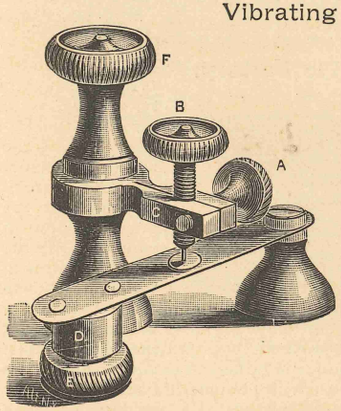
How to Connect the Battery with the Instrument.

Connect the metallic clamp attached to the platina plate; and which is the positive electrode of the battery, with the post marked P, [which, in the usual form of the instrument, is at the back and right end of helix,] connect the metallic clamp attached to the two zinc plates, which is the negative electrode, with the corresponding post, marked N, at the back, and near the other end of the helix. Place the switch on the front post to complete the circuit. When very weak power is desired, place the switch on the back post. In each case the power is increased by withdrawing the tube from the helix.

In using two batteries, connect the positive of one with the negative of the other, and connect the remaining positive and negative with the instrument, according to directions for the single battery.

Upon connecting the battery with the instrument, if the spring does not readily vibrate, give a slight impulse with the finger, and it will continue to vibrate by the power of the battery. The spring should vibrate all the while the instrument is connected with the battery, otherwise the zincs would wear away by increased action.

Vibrating Arrangement.



The parts of the interrupting arrangement, lettered in the diagram, when properly adjusted, are to be then let alone.

When they are properly adjusted, A binds the brass C moderately against the screw B, whose point very slightly presses against the spring, admitting of its vibration.

The head of the magnet E should be turned up near the hammer D, when the solution of the battery is weak, but not so near as to allow the hammer to strike the magnet when the spring vibrates. The machine works better when the hammer does not strike against the magnet. This arrangement affords perfect adjustment of the distance between the hammer and the magnet, without altering the stiffness of the spring. By loosening the nut F, the shaft holding the screw B can be moved so that the platina point of this screw can be located at different points longitudinally on the platinum disc, affording more rapid vibration when this point is moved toward the hammer. The nut F should be turned so as to bind the brass parts firm in their required position.

The point of the screw B, which point I make usually of a straight platinum wire, should barely touch, or press very lightly upon, the platinum plate upon the spring, and when properly adjusted there is seldom occasion to disturb it.

The platina point, and also the disc on the spring, may occasionally need cleaning, to secure free passage of the current of the battery from one to the other.

☞ Also, the wires to connect the battery with the instrument, and their sockets, should be kept clean, to insure good connection, and thus give free passage to the current.

Switch.

On most of the machines there is a switch in front, at the left, through which the current must pass to complete the circuit. When the switch is placed on the front post the power is stronger, and when placed on the back post the power is weaker. In each case the power is increased by withdrawing the tube from the helix. When the switch is placed on the back post, then the magnet E should be (by turning it to the left) brought nearer the hammer D, to cause the spring to vibrate well, but not so near as to interfere with its regularity of vibration.

When the battery is connected with the helix as directed, then using *any two* of the lettered posts A, B, C, D, etc., the left hand is *positive* and the right negative.

☞ If the battery should be connected with the instrument in a manner reverse from the directions the CURRENTS WOULD BE THE SAME from the same posts BUT THEIR DIRECTIONS WOULD BE REVERSED. To distinguish the poles, hold one in each hand; THE ONE WHICH IS FELT THE MOST IS THE NEGATIVE.

The Five-Post Instruments have ten currents of electricity, differing in their magnetic, electrolytic, and sensational effects. The different electrodes which give these currents are distinguished by the several letters, A, B, C, D, E, stamped upon the posts.

The Four-Post Instruments have six currents of electricity, differing in their magnetic, electrolytic, and sensational effects. The different electrodes which give these currents are distinguished by the several letters, A, B, C, D, stamped upon the posts.

The Three-Post Instruments have three currents, A, B, D.

CAUTION.—Practitioners should be on their guard in reference to certain fictitious machines where a coil is tapped, and at different points connected with several metallic parts, and falsely claimed to be like DR. KIDDER'S manifold apparatus.

Because Electricity is Recognized as an important agent to give tone to the vital functions, and also to attack the principles which are the foundations of many forms of disease, much care should be given to the character of the apparatus used.

The principal features of superiority in these machines are:

1. The combinations securing greater range in the qualities of currents.
2. A new form of constructing the helix, by which, with the same amount of surface of metallic plates in battery, far greater strength of electro-magnetic currents are secured; and there is arrangement to reduce the power to any required degree.
3. The most perfect means controlling the magnetic force on the oscillating armature, to secure smooth and perfect operation under any degree of battery power.

True scientific men have recognized that variations in quantity and intensity or tension, are variations in quality, as shown by their physical effects. And the continually increasing evidence is recognized that they vary in quality, as shown by their physiological effects also. Yet the masses of the people have fallen into the error of using the word intensity, or tension, as synonymous with power.

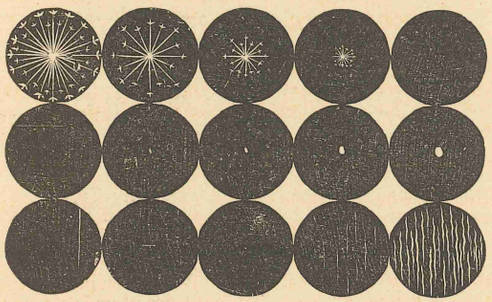
The true meaning of intensity is not power. When that term is so used it is misapplied.

The degree of power of the induced current of an electro-magnetic machine is determined by the strength of the magnetic force upon the helix. But the degree of tension of the induced current is determined by the physical condition of the helix itself.

The ordinary electro-magnetic machines are constructed principally to vary the power miscalled varying intensity or tension.

Our apparatus are constructed to vary the power or force of each special current, and also to have more varied degrees of tension or quality.

The variations in the qualities of electricity come under the general terms *quantity and tension from want of better terms to express the same.* Helices producing quantity currents give a deflagrating spark, shown best when one electrode is iron, and the other a metallic point drawn across it. The following diagram shows the tests, in this manner, of currents differing in quantity and tension :

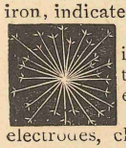


The two upper lines show the variations in the quality of spark produced by currents differing in their ratios of quantity and tension, tested by drawing a metallic point, as an electrode, over a piece of rough iron or steel as another electrode. Of these two, the uppermost line shows the quantity influence, which decreases from left to right in the diagram as the helices are varied to produce induced currents of diminished quantity, though of increased tension.

But the kind of spark to indicate the increased tension is not shown in this line, but is shown in the second or middle line ; it is a small white spark which does not deflagrate, increasing (from left to right in the diagram) as the helices are varied to produce induced currents of increased tension though of diminished quantity.

The lower line shows that the induced current produces light to the eye, that is, it exercises the functions of the optic nerve *without producing pain*, only when the tension of the current is increased to a certain degree in ratio with the diminished quantity. This effect is shown best by using the negative sponge at the eye.

The spark of the current of low tension and large quantity, if it be produced by a short fine wire drawing its point upon rough iron, will exhibit the marked phenomena of radials forming a star at the end of each main radial, as it burns the iron, indicated by the following diagram :



As we approach the more acute angle, the radials of the spark diminish in size, and the small radials at the end of each main radial, though *always* existing when produced as stated above, are less easily discerned.

The whitish spark existing between the points on separating the electrodes, characterizes the current which gives sensation and it is larger according as the current is more tense, or diffusive in its nature, as from *A* to *D*, represented by the acute angle.

The current *B C* when made strong and *taken by a person who can bear considerable power*, will give more cutting pain in the wrist compared to the amount of contractile power upon the muscles, while the current *A D* will be more diffusive in its sensational effect, and give little or no pain, though the contractile power upon the muscles is very great. But let it be distinctly understood, that a *person who can bear only a very weak power can not so readily distinguish this difference.* There is also another circumstance which determines the first result, that is the ELECTRICAL POLARIZATION of the sentient nerves caused by habitually passing a sensational current through a portion of the arms in a uniform direction. The negative pole gives the strongest sensation, but the system by thus habitually receiving it becomes accustomed to the quality of the current which characterizes this difference, so that it is not so easily recognized till the current is sent through the arms in the opposite direction ; then the pain is severe in the wrist though the current be of weak power and high tension.

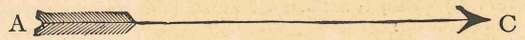
By passing the current through a portion of the body, as through the arms, from hand to hand, always in one direction when used, and using on successive occasions for a long time, the nerves of sensation in the wrists become so polarized that a very weak current in the opposite direction becomes scarcely endurable. This fact seems to indicate that sensation and pain are referable to the laws of electrical polarities.

ELECTRO-THERAPEUTICS.

DIRECTIONS.

☞The instructions which accompany the instrument for its operation should be carefully read.

The posts which deliver the currents are stamped with the letters A, B, C, D, E, etc. In selecting the current, be guided entirely by the letters, for any two posts which have the same letters as



always give the same current, regardless of their relative position; for that may be changed in some instruments, for compactness and portability or other convenience.

The letters P—N, which accompany the letters A, B, C, D, E, etc., in the directions for the applications, in this work, indicate which is positive and which negative when the instrument is connected with the battery, according to the directions. The *electrodes* of the Faradaic current would be properly denoted by

the smaller letters indicating the direction of the weaker one of the alternating, but the latter are omitted, as we are guided in the applications by the direction of the stronger one of these currents.

It is well understood that the current goes from the positive to the negative, and that two, and two only, of these posts are to be used for a current, as it is necessary to have a positive and negative in order to secure the same.

When we have desired to represent simply electro-magnetic induction, without the galvanic current which electro-plates, I have used two arrows—one smaller than the other, and pointing in opposite directions. This current has been called Alternating by various writers on electricity. But let it be distinctly understood that the use of this term does not express the exact quality of the current in this respect, especially as developed when the human body is a part of the closed circuit—it is the induced current not accompanied by the *electrolytic* galvanic or electro-plating influence.

We will state here again, that it is a RULE when the battery is connected with the instrument according to the direction; that in using any two of the lettered posts, the first letter in the *order of the alphabet* is positive, while the succeeding one is negative. It is *customary to express* that the current goes from the positive to the negative. To determine the direction by the sensation, the negative is felt more intense.

Sponges are to be attached to the holders. The surface of the wet sponge is soft, and adapted to the uneven surfaces of the body, and can be as large or small as desired. See page 45.

Instead of the foot-bath, with the electrode introduced large metallic surfaces are also used. And some practitioners make particular use of them for other parts of the body; having wet cloth [muslin] intervening.

General Rules.

The directions given in this book are available to cure disease. In stating that a STRONG POWER as the patient can bear should be applied, it should be understood that the power should be as strong as can be borne without discomfort; and this power can be gradually increased as the patient acquires the power to bear more. In cases of dyspepsia, use quite as strong power, not only over the stomach, but the bowels also.

When it is desired to arouse by action on SENTIENT NERVES, or stimulate the force of SENSATION, use the currents (A—C), (B—C), (C—D). When it is desired to SOOTH to sleep, and secure the refreshing stimulus of rest, apply the Currents (A—D), (B—D), and more especially (A—E), giving general applications down the spine and over the body (negative under the feet).

In cases of inflammation and soreness, some apply the POSITIVE POLE over that part, as a general rule. Yet experience will prove that there are conditions of incipient inflammation and ulceration where the pain and soreness will be overcome more promptly by applying the NEGATIVE.

Qualities of the Currents of the Machine.

The machines we are now introducing have their currents given out from various two of the posts stamped with the letters A, B, C, D and E; and these currents have each different qualities.

A B, delivers a galvanic current which will perform electro-plating, and possesses powerful magnetism; it has also a faradaic (induced) current of high quantity, but very low tension.

A C, delivers a galvanic current which will electro-plate, and also a faradaic (induced) current of moderate tension.

A D, delivers a galvanic current which will electro-plate, and also a faradaic (induced) current of high tension. The influence being thereby more diffusive, with a tendency to locate the limit of its principal action a further distance from where the electrodes are applied, and the sensation is comparatively soft, as recognized through the sentient nerves, even when the current is made so strong that it has forcible power upon the contractility of the muscles.

A E, delivers a galvanic current which will electro-plate, and also a faradaic (induced) current of exceedingly high tension, producing a soothing effect. This influence of the quality of induced currents of a high intensity and low quantity, if of the proper range in this respect, and properly used, will, in their mixed effects on the various nerves, act more to repress pain than to excite sensation.

B C, delivers a faradaic (induced) current only, and its tension is the same as that of A C, less the small amount of that of A B. When the electrodes are in the hands, this current will act more comparatively at the wrist, and with a peculiar cutting pain, if the current is made strong—notwithstanding the current must "go" the whole circuit.

B D, delivers a faradaic (induccd) current only, and its tension is the same as that of A D, less the small amount of tension of A B.

B E, delivers a faradaic (induced) current only, and its tension is the same as A E, less the effect of A B.

C D, delivers a faradaic (induced) current only, of a medium tension, and therefore its character is MEDIUM between the concentration of B C, and the diffusive of B D, and the sensational with the contractile influence may properly be called energetic.

C E, delivers a faradaic (induced) current only, of moderate tension, and classified as energetic.

D E, delivers a faradaic (induced) current only, of a somewhat soothing character, between the energetic and contractile.

For a more detailed description of the different qualities of electricity, we refer the reader to ELECTRO-ALLOTROPO-PHYSIOLOGY in the fore part of this work.

To guard against error, it is important to remember the distinction. TENSION is NOT POWER, but a QUALITY of current, and to prove the distinction, the current B C, though made strong as can be endured, with the electrodes in the hands will still retain its quality to localize its action in the wrist, while the current of a higher tension, as B D, will give a more diffused and extended power of contraction upon the muscles of the arm, while it is comparatively softer than B C, to the sensation, as recognized through the medium of sentient nerves.

It is the induced current only which causes the spasmodic contraction of the muscles at the moment of the interruption of the primary circuit, whether the medium of induction is a helix or electro-magnet, or whether it is the wire conductors and the metals of a series of batteries alone.

To perform ELECTRO-PLATING with the ELECTROLYTIC currents A B, A C, A D, and A E suspend from a wire attached to the positive electrode a strip of silver, or a ten-cent piece, into a cup of silver solution, and suspend likewise from the negative into the same solution a piece of brass or copper well cleaned.

After a few minutes it is perfectly plated, a fine coating of silver adhering firmly upon its surface.

All the currents produced when A is used as one of the electrodes, will electro-plate, but they differ in the galvanic and magnetic power, which diminish in proportion as we go from a lower to a higher tension.

AGUE CHILLS [AP—DN].

The patient must be in a warm room, remote from the fire, and just before the chill comes on place the negative electrode on the back of the neck, on the second cervical vertebræ, and using a sponge-electrode rub the positive briskly over the region of the stomach, liver, and bowels, and also down the spinal column, for a few minutes; then place the feet in warm water with the negative electrode, and rub the positive downward from the second cervical vertebræ down the spinal column and over the chest, to the region of the liver, stomach, and bowels. Use strong power for 10 or 15 minutes. Invigorate the patient by daily applications.

AMAUROSIS—BLINDNESS FROM PARALYSIS OF THE OPTIC NERVE [AP—DN].

The negative electrode may be in the hand of the patient, or on the neck, between the shoulders. Apply the positive electrode over the eye by means of the eye-bath, a moistened sponge, or the fingers of the operator a few minutes daily. Use weak power of the Current [AP—DN]. It is better to use weak power of the battery to run the instrument. Blindness, caused by night sewing, is treated in the same manner, or by placing the electrodes on the opposite sides of the cornea, with a slight current 10 minutes twice a day.

APHONIA, OR SUPPRESSION OF THE VOICE [AP—DN].

Place the positive electrode on the tongue by means of a spatula (tongue-piece), and move the negative down the neck, over the throat, with a small sponge surface, for one or two minutes; then change the positive to the back of neck, and move the negative, small surface of sponge and strong power, over the throat and upper portions of the pectoral muscles 10 minutes. Now the position of the poles may be frequently changed during a few minutes. The loss of voice is sometimes caused by a mechanical derangement, from the relaxation of the abdominal muscles; also the sagging down of the diaphragm, leaving the heart and lungs hanging by the trachea, causing a strain upon the trachea by which means the patient is deprived of his vocal powers. In these cases there will be sometimes a palpitation of the heart, which does not indicate any organic disease of the same, but is merely sympathetic with the mechanical derangement. In such cases general applications should always be given, placing the feet in warm water with the negative electrode, applying the positive down the spine and about the neck and region of the thorax and abdomen for 15 minutes daily.

ASPHYXIA BY DROWNING [AP—DN].

When life has become apparently extinct, the patient may be restored by placing the positive electrode on the back of the neck while the negative is moved along the margins of the ribs from the scorbiculus cordis, so as to influence the diaphragm and ganglionic nerves. The current strong power. Also the patient should be kept warm and dry with flannels and rubbing. When asphyxia occurs by poisoning, the Current [AP—DN] particularly should be used, strong power.

ASTHMA [AP—DN].

Place the poles as indicated in suspended animation, and operate for 10 minutes, then place the negative upon the first dorsal vertebræ, and the operator taking the positive in one hand, rub upward, rubbing the throat and chest under a moderate power. Treat every two hours, if the attack be violent. In chronic cases use the above treatment one day, and the next day use the following treatment: Give a general application, placing the feet in warm water with the negative electrode, applying the positive down the spine and also the intercostal mus-

cles, following down the ribs over the region of the thorax or chest. It may not always cure, but it is most successful in young persons.

Some claim good success, using the positive electrode on the pit of the stomach, along the region of the diaphragm and the sternum and pectoral muscles, and the negative on the posterior cervical ganglion for several minutes; and then with the negative at the coccyx (lower part of the spine), moved the positive from the back of the neck downward along the spine for several minutes more—making, in all, about a quarter of an hour.

ATONY OF THE STOMACH [Bp—Dn] IS EFFICIENT.

The operator takes the positive in one hand and the negative in the other—having them insulated from himself—placing the negative at the back, and the positive in front, passing both the hands downward, at the same time carrying the positive over the stomach and abdomen.

BURNS [Ap—Dn] [Ap—En].

Current is a sovereign remedy for burns. It is proper to place the positive above, and the negative below the burn, using a strong power. It will relieve the pain and the soreness. If it be a limb, place the extremity in water with the negative electrode, and apply the positive above the burn, large surface electrode [large sponge]. If it be the body generally, immerse the person in a bath, and run the current through from opposite sides, or opposite ends, placing the positive at the head, and the negative at the foot, of the bath, or move the negative down the sides of the bath, without touching the patient with the metallic electrodes. In using the bath, several batteries may be connected to run the instrument, because it is applied over a large surface, and therefore, a great power can be comfortably borne.

CANCER [Ap—Dn].

Place the positive electrode to the back of the neck, and pass the negative over and above the swelling a few minutes twice a day.

CATARRH [Ap—Cn].

If chronic, place the positive electrode at the back of the neck, or lower part of the head (hair cut or wet), and apply the negative over the part affected.

CATARACT.

Apply as for Amaurosis.

CHLOROSIS [Bp—Dn].

First, give *general applications* to restore the health. Some give preparations of iron to make up for previous deficiency of it in the blood. After the general health is restored, stimulate the uterus by local application of electricity.

COLDNESS OF THE FEET AND HANDS [Bp—Dn].

Pass the current from hand to foot, and in opposite directions; also give general applications.

COLDS [Ap—Dn].

The action of the Current A D, is very effective to ward off or cure the severest colds; general applications will open the pores and cause perspiration, and at once neutralize the effects caused by taking cold. This is a valuable remedy, which should always be at hand, and cannot be too highly appreciated.

CHOREA—ST. VITUS' DANCE [Bp—Dn].

First place the negative electrode at the coccyx (lower part of the spine) and pass the positive from the neck down the whole length of the spine for several minutes, and then place the feet in warm water with the negative electrode, and with the positive make a general application down the spine and over the body 15 minutes daily. When the heart is seriously affected, the current must be very slight over that region.

CRAMPS [Ap—Dn].

Place the positive electrode on the back of the neck, on the second cervical vertebræ, and move the negative down the spinal column and over the waist and thorax muscles. If the muscles of a limb be affected, embrace them between the sponge-electrodes for a few moments, and then place the negative beyond the affected parts, toward the extremity of the limb, and move the positive toward the negative over the muscles.

DEAFNESS FROM PARALYSIS OF THE ACOUSTIC NERVE [Bp—Cn], [Ap—Cn].

Apply the positive to the ear by means of the conductor for that purpose (Ear Electrode), or a small sponge, or the fingers of the operator, the patient taking the negative electrode in the opposite hand, a few minutes daily.

DELIRIUM TREMENS AND MUSCLE TREMBLINGS [Ap—Dn].

Use mild power, placing the negative at the extremities, and moving the positive toward the negative from the origin of the various muscles. Keep the patient dry and warm, and apply 15 minutes daily.

DROPSY [Ap—Dn].

Place the electrodes, with small surface, near each other, and move them over the body where affected, using strong power as can be borne, 20 minutes daily.

DYSPEPSIA [Ap—Dn].

If the appetite be craving, place the positive electrode at the feet or at the lower part of the spine, and apply the negative over and about the stomach. If the appetite sympathized with the disease, treat in the same manner, except with the electrodes reversed. Use 10 or 15 minutes daily.

These cases are successfully treated, also, by placing the feet of the patient in water, or on a metallic surface, with the negative electrode, and apply the positive down the spinal column and over the body.

ENLARGEMENTS OF THE JOINTS [Ap—Dn].

The application should be both general and local when acute. When chronic place the extremity of the foot or hand in warm water with the negative electrodes, and always commence above the enlargement with the positive, rubbing downwards.

EPILEPSY [Bp—Cn], [Ap—Dn], [Bp—Dn].

Place the negative electrode at the coccyx (lower part of the spine), and apply the positive over the back part of the head, wetting the hair, and using the Current [Bp—Cn] for a few minutes; then use the Current [Ap—Dn], and move the positive down the spinal column, slow vibration, for 15 minutes daily. General applications may also be given with the negative at the feet; but this disease indicates the application chiefly to the peripheral nerves and nervous centres. When the source of the disease is in the sentient nerves of the skin, general application of the Current [Bp—Dn] will be indicated; but if the origin of the disease be in the stomach, bowels, or ovaries, use the Current [Ap—Dn] with rapid vibration of the spring, applying the positive to those parts.

FALLING OF THE WOMB [Cp—Dn], [Bp—Cn].

Apply the positive to the part affected, and the negative on the spine, between the hips, across the ossacrum. Use 10 minutes daily. Electricity is the true remedy.

GASTRITIS AND CONSTIPATION [Ap—Dn].

Move the negative electrode down the spine, and at the same time move the positive downward over the stomach and bowels on every part, pressing and relaxing alternately the positive. Fæcal evacuations can be readily produced by placing the positive on the tongue and applying the negative to the anus, using at first a mild current, and increasing it gradually as can be borne.

HEADACHE [Ap—Dn], [Ap—En].

Some have recommended the applications to be made over the forehead and about the head generally. The forehead is very sensitive to the induced currents, and can bear only a very weak power. It will be found that applications upon the forehead sometimes aggravate the disease. Experience justifies the almost universal application of the negative electrode to the back of the head, close to the neck. This is often almost an immediate remedy. The positive electrode may be in the other hand, or if it be sick headache, the positive may be moved over and about the stomach and liver.

HYSTERICAL CONVULSIONS [Bp—Dn].

Give general applicatious with a moderate power, rubbing the positive, large surface electrode down the spine, chest, abdomen, and limbs, with the negative at the feet.

LOCKJAW—TETANUS [Ap—Dn].

Place the negative electrode at the coccyx, and pass the positive down the spine with mild power. Apply also to the muscles affected. Continue till the symptoms are removed. At the same time enlarge the wound—if so caused —so as to give full vent to throw off the secretions. Some have advised to scrape the epidermis on the back of the neck, and put on the spot a disc of clean zinc two inches square, wet with water and place on the wound of the foot a silver dollar wet likewise with salt water, and connect these metals by means of a copper or silver wire insulated so as not to touch the patient. Repeat the applications as often as the symptoms recur, and the cure will be affected.

LUMBAGO [Ap—Cn].

Put the patient in a warm sitz bath, when practicable, the negative electrode in the bath under the patient, drawing the positive down the spine and over the lumbar region and the psoas muscle. Use 15 minutes daily.

NARCOTISM FROM LAUDANUM OR OPIUM [Ap—Dn].

The fatal sleep which often results from the effect of these poisons will be prevented by this remedy. Place the electrodes in the hands of the patient, passing the current through the arms and chest; also apply the current (strong power) directly through the chest in various directions.

NEURALGIA [Bp—Dn].

If the nervous system be generally affected, place the negative electrode at the lower end of the spinal column, and apply the positive on the neck, making slow and regular movements down the spine and also over the muscles of the back. Let the positive follow through all the localities of pain, and continue the application till they be driven away.

When the affection is local, place the positive electrode above, toward the origin of the affected nerve, and the negative beyond the region of pain, toward the other extremity. In applying for neuralgia use moderate power (run the instrument with weak battery power in this case), but if it does not effect the desired result, increase the power to a strong degree.

ORGANIC LESION OF THE CEREBRAL OR SPINAL CENTRES.

Dr. Golding Bird gave substantially these directions as conforming to his experience: When the lesion is recent, the cause producing the lesion still active, electricity and its modification will do no good, but often do much mischief. Especial caution should be used where rigid arteries are known to exist, or where ramollissement of the brain is suspected. [In more than one example of these affections he knew a fatal apoplectic fit to follow the remedy in question.] In paralysis accompanied by *rigid flexure* of the thumb or fingers, he never found that electricity did any good.

In cases of paralysis depending upon some physical cause, as effusion or pressure from other sources, when the original cause has been removed by time or treatment, or both, and the palsy remaining, electricity, and especially the electro-magnetic form of it, is of the utmost value. A patient has, for example, congestion, influencing chiefly one side of the brain, and the arm or leg, or both, become paralyzed. After some time the circulation is equalized, the pressure is

removed, and the paralysis, if the case be recent, disappears. If, however, the congestion has been *of longer duration*, the palsy does not disappear with the removal of the exciting causes, and then the passage of the single (Direct) Electro-Magnetic Current in the course of the nervous ramification *becomes invaluable*. Often in a few days the patient recovers his power. ☞ In such cases of chronic paralysis he advised perseverence in the treatment; for if the paralysis be long continued, some of the new tissue deposited in the palsied muscles in accordance with the recognized laws of nutrition, has never contracted or moved under the influence of the will, and patient persistence in the electrical treatment will be necessary before the new fibres become roused into obedience to the *vis nervosa* propagated along the nerves by the volition of the patient.

PARALYSIS [Bp—Dn].

When there is organic lesion, so as to interrupt the continuity of communication with the organs of volition, by local injury to the structure of a nerve, as by a blow or other applied violence, no benefit can accrue, nor indeed can be expected from electro-magnetism; but when there is no organic lesion, this remedy will be found efficient. Paralysis, when attended with premature contractions, or when the source of permanent irritation exists in the brain or spine, should not be treated with electro-magnetism. But where the rigidity is not persistent, but transitory, rather, electricity, properly employed, will cause it to pass away more rapidly. In such cases it is perhaps better not to direct the current from the extremity to the nervous centres, but place the electrodes on the affected muscles nearly transversely and near together as convenient, so confining the electro-magnetic currents within the muscles to which they are applied.

PARALYSIS OF THE BLADDER [Cp—Dn].

Tone will often be given to the bladder, restoring it to the dominion of the will, by passing the current from the sacrum to the pubes a few minutes daily.

PARALYSIS FROM AN EXHAUSTED STATE OF THE NERVOUS CENTRES [Bp—Cn], [Bp—Dn].

This may occur from flooding labor, from over-lactation, or from leucorrhœa, from over-work and care. It is recommended to arrest the drain upon the system by building up power by means of good food, fresh air, and sufficient exercise, and rest. Some recommend hematic tonics, and especially preparations of iron. The stimulus of electricity will be most efficient to effect the cure. To cure the paralyzed arm, place the negative electrode over the cervical spine, and the positive in a basin of warm water in which the hand is immersed a few minutes. Use successively the Current [Cp—Dn], [Bp—Dn], strong power.

PARALYSIS OF SENSATION—AN ÆSTHESIA [Cp—Dn], [Ap—Dn].

When the seat of the disease is in the skin, make the applications with strong power, by means of metallic electrodes. The metallic brush is also good. The electrodes may be placed near each other, and moved over the surface. Anæthesia also occurs from a lost susceptibility to impressions, occasioned by nerve exhaustion, by over-lactaion or over-use. It is also sometimes functional, as occurs in females about puberty. These cases will be similar to what is noticed above. [See paralysis from an exhausted State of the Nervous Centres. The cases will be cured by the Current [Cp—Dn], applying the positive upon the affected parts, and the negative on the spine above the origin of the affected nerves, fifteen minutes daily. When the anæsthesia is caused by original lesion, as accident to nerves, that must be first subdued, only a mild galvanic current is admissible; or use the magnetic current with the very slight sensational influence as will be found emanating from electrodes Ap—Bn. Afterward the cure will be facilitated by the Current [Ap—Dn], placing electrodes near each other, and moving them over the affected part. If the lower limbs be affected, place the positive on the lower part of the spine, and the negative with the feet in warm water. After a few moments move the positive down the whole length of the spine and over the lower limbs, using the Current [Ap—Dn] 15 minutes daily. If the arm be affected, place the positive on the cervical spine and the hand in warm water with the negative electrode. After a few moments rub the back of the neck with the positive, also the arm where affected, applying especially to the origin of the affected nerves.

RHEUMATISM [Ap—Dn].

Embrace the muscles affected by the electrodes, placing the positive at their origin, and moving the negative downward toward their extremities.

In Acute or Inflammatory Rheumatism, place the feet in warm water with the negative electrode, and apply the positive down the spine and over the stomach, spleen, and liver, with strong power, for half an hour.

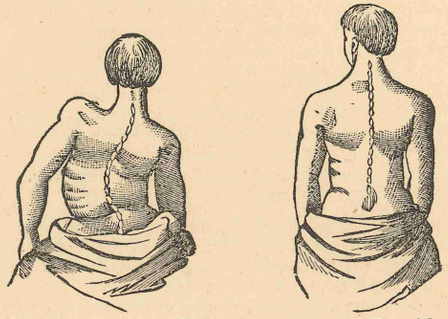
RICKETS AND GOITRE [Cp—Dn].

Apply the the positive electrode to the nape of the neck, and the negative over the part affected, moderate power, 15 minutes daily.

SCROFULA [Ap—Dn].

Apply the negative electrode to the parts affected, and positive on the back of the neck. It should be remembered that the negative electrode of the electrolytic currents have a healing influence in all cases where there are eruptions. If it be desired to drive them away, then apply the positive.

SPINAL DISEASE AND CURVATURES [Ap—Dn], [Cp—Dn].



These cuts represent the case of W. S., residing in Brooklyn, which came to my immediate observation. The curvature was of three years' duration, and had become aggravated about four months previous to electrical treatment, which, in thirty-five days, brought the patient to a position nearly straight, a slight bunch only remaining, which is gradually passing away.

There are many different classes of curvatures, and therefore no positive *rule* in regard to the applications. It is the practice of some, as a general rule, to place the negative on the relaxed muscles, and the positive upon the contracted ones. The *theory* that the positive is expansive and the negative contractive, favoring the superior utility of this method, is not established as regards the *induced* (sensational) *currents*; both will cause contractions, but the negative more than the positive. As a *general rule*, the applications should be made with the positive electrode with large sponge surface, moving it downward the whole length of the spine, with the feet in warm water with the negative electrode; or, place the negative electrode at the lower part of the spine. It is claimed by some that, in using electricity in these cases, the use of artificial supporters should be dispensed with, thus giving the recuperative forces of nature an opportunity to act.

THROAT DISEASES [Bp—Dn], [Ap—Dn].

Bronchial affections and inflammation of the tonsils are very susceptible to the remedial influences of electro-magnetism. When bronchial disease arises from weakness and over-exertion, apply the positive of the Current [Bp—Dn] all about the throat and over the chest, following the course of the wind-pipe, while the negative is on the back between the shoulders.

TORPID OR ENLARGEMENT OF THE LIVER [Ap—Dn].

Put the feet in warm water with the negative electrode. Pass the positive electrode, beginning at the spine and drawing forward in the course of the ribs, following the intercostal muscles, over the region of the liver. Apply 15 minutes daily.

ABSTRACTS.

Electrical Treatment of Epigastric Pains in Hysteria.

The *Chicago Medical Journal*, February, 1883, says: "These pains, which are mostly accompanied by severe vomiting, have been successfully treated with the galvanic current by Dr. Apostoli. The positive pole is applied in the subclavicular region, and the negative pole over the seat of the pain. It is continued for 5 to 15 minutes, and it is said to have stopped the vomiting entirely. The gastralgia and epigastric pains have been stopped after ten to fifteen applications."

Electrolysis in Partial Trichiasis.

By Mr. Arthur Benson.

British Medical Journal, December 16th, 1882.

Some method of getting rid of individual cilia, without displacement of those in their immediate neighborhood, has long been a desideratum. We often see several hairs growing in a wrong direction on the lid border, the remaining cilia being in a perfectly normal position.

Ophthalmic surgeons have had recourse to one of the following methods for the relief of the above condition: Epilation, which is, however, unsatisfactory, as the irritation of the young hairs will most certainly increase the irritation which the epilation for a time relieved; the second, or classical method, is snaring of the hair and turning its direction ot growth outwards, instead of inwards; but the snared hairs are very liable, sooner or later, to resume their previous vicious direction.

Mr. Arthur Benson, *British Medical Journal*, Dec. 16, 1882, finding these operations unsatisfactory, has adopted the following plan:

"To the negative electrode I attach a rather fine gold electrolysis needle, and insert the point of this to a depth of about four or five millimeters along the hair to be destroyed, so that its point should reach well above the root. I then applied the positive electrode to the lid near the outer canthus; contact was conveniently made by wrapping some wet cotton wool around the end of the wire. In a few seconds, the tissues immediately around the needle (negative electrode) began to show white, and soon a distinct bubbling of hydrogen gas could be observed. Half a minute or so, according to the strength of the battery, usually sufficed to completely loosen the hair. I then withdrew the needle, and the positive electrode, and with the fingers or forceps removed the hair. It should come without requiring the slightest drag, and bring with it a gelatinous-looking mass of dead tissue. If the hair be not sufficiently loose the needle must be re-applied for a few seconds. The amount of inflammation of the lid resulting is not usually great."

In 120 cases so treated no untoward result was seen. The advantages which the Doctor claims for his method, over epilation, snaring, or the actual or potential cauteries, are these:

1. Any individual hair can be destroyed without injuring those beside it.
2. The hair can be got rid of at once and forever.
3. Hairs of any length, strength, or position can be treated.
4. By its early use it will render unnecessary many of the more formidable operations on the lids, besides saving the patient much misery.

If applicable for the cilia, electrolysis should be equally applicable for the destruction of hair follicles elsewhere, in moles or hairy-faced females.

Treatment of Obstinate Vomiting by Electricity.

By Dr Leven, *Progres Medical.*

The Doctor reports several cases of persistent vomiting treated successfully by the application of electricity to the interior of the stomach. The conducting wire is inserted in the stomach by means of the esophageal sound. Dr. L. states that after four or five applications he has been able to check vomiting that had resisted all other treatment.—*New Eng. Med. Mo.*, Jan.

Use of Electricity in Cases of Suspended Vital Function.

By John J. Caldwell, Baltimore.

(*American Medical Journal*, July, 1885.)

We have been induced to try the effects of electricity in cases of suspended vital function resulting from narcosis, and cases of apparent death from drowning, from experiments upon living rabbits made by Dr. Wilson Philip, of England, from which it appears that electric force was used to substitute nerve power. The pneumogastric nerve of the animal was severed immediately after it had eaten some parsley. After the death of the animal, which had great difficulty of breathing, and perished from suffocation, the stomach was opened and the parsley found undigested. A similar experiment of section of pneumogastric nerve was made, but a current of galvanism passed along the nerve and continued for twenty-six hours. No difficulty of breathing occurred as long as the current was kept up. The animal was killed, the stomach examined ; the parsley was completely digested. It thus appeared that galvanic energy is capable of supplying nervous influence, in that the process of digestion may be carried on. Similar experiments were made upon dogs with like results.

The following cases illustrate the beneficial effects of electricity to restore suspended and impaired vital function :

Case I.—In the summer of 1873 I was called to see a child, Jennie C., suffering from a poisonous dose of laudanum. Every other means except electricity had been tried without benefit. The laudanum had been swallowed some twelve hours. A powerful current was continued for more than three hours, with the result of complete restoration. The respiration from nine the minute was increased to eighteen or twenty, when the pupils began to dilate, the pulse became normal and consciousness was restored ; vomiting and purging ensued. The current was passed by placing the positive pole over the pneumogastric nerve, at the angle of the sternocleido-mastoid muscle, and the negative pole over the epigastrium.

Case II.—In 1874 I was called to attend a person in the Maryland Inebriate Asylum who attempted suicide by taking opium. The usual remedies had been tried and found unavailing. A Faradic current was applied and continued from 3 A.M. to 7 A.M. The respiration rose from seven to eighteen the minute. Patient restored.

Case III.—Was one of dyspnœa from delirium tremens. Faradism was applied, but the poles reversed in order to obtain a sedative rather than a tonic effect. Within a few hours nervous excitement subsided, aided by large and frequent doses of digitalis, sleep ensued. The patient recovered.

Case IV.—Twenty taken from the *Med. and Surg. Reporter*, New York, reported by Ed. C. Harwood. An infant aged nineteen days had been narcotized by morphine. He was relieved by means of the Faradic battery.

Case V.—Reported by Prof. W. H. Pancoast (*Med. and Surg. Reporter*, May 9, 1874). The patient had taken one hundred and twenty grains of chloral and eight grains of morphia. The battery was used fourteen hours and life saved.

Case VI.—George, a colored boy, was fished out of the dock half an hour after immersion, apparently dead. I had but slight hopes of his resuscitation. There was some heat about the spinal column and head. I applied a powerful secondary current for several hours. At length I discovered faint heart signs, then occasional sighs, which greatly augmented. The organs gradually resumed their functions. The patient was restored to life.

Case VII.—Is reported in the *Virginia Med. Monthly*, May, 1874. "Resuscitation after thirteen and a half minutes of apparent death." At a meeting of the College of Physicians and Surgeons, New York, March 11, Dr. L. A. Sayre exhibited a string of beads, one of which had been taken from the trachea of a child seven years of age. She was relieved by tracheotomy. She coughed out the bead, gave one inspiration and died. Alcohol was injected into the rectum, and the galvanic current passed through the phenic nerve. She immediately rallied, and then had no further trouble.

Such are some of the wonderful effects of electricity (Faradism) in restoring

suspended animation. They suggest the propriety of placing proper batteries and instruments in all life-saving stations, police headquarters, hospitals, and other institutions, so that the aid of this powerful and wonderful agent may be invoked in all cases of suspended vital functions.—*The Med. Herald.*

Revelations by Electricity,

in Rheumatism, Neuralgia, and Chronic Conjunctivitis.

By F. T. Payne, M.D., Comanche, Texas.

(*Daniel's Texas Medical Journal*, January, 1886.)

In July, 1885, Mr. J. E. DeWitt, aged fifty-eight, presented himself at my clinic, led by a pilot, he being blind from, as he claimed, Neuralgia, and from which he had frequently suffered, and lost his right eye. On examination, I found the left eye intensely congested ; in fact, I could scarcely discover anything but a mass resembling coagulum filling the orbit. He had slept none, he said, for six nights and days, and was suffering intensely. A thirty-minutes' seance with the electric current relieved the patient so much that he left for the night. On the next day he could begin to distinguish day from night, and, after the third seance, dismissed his pilot and could sleep soundly all night.

On one occasion, while applying the electric current directly to the globe, he detected, as he said, a spot about the centre of the eyes that had no feeling whatever, or upon which the Faradic current produced no impression. Upon this spot, as near as possible, for I had to rely upon his feeling entirely, I concentrated the current until he felt it. He instantly exclaimed, "I can feel it now, and can see better, and the current is pleasant." From this time on he continued to improve, and in one week from the time he commenced treatment, he was enjoying his usual health, with as good sight as he has had for years.

The inflammation has entirely subsided, the granulations and ulcerations have disappeared, and he has reported to his Conference for regular work as an itinerant minister.

The next case was that of Reverend P. W. Graves, who presented himself in August, for chronic sore eyes, with granulated lids and ulcerated cornea, and numerous nebulæ. He, too, being entirely blind, was led by a pilot. The Faradic current was used through an eye cup of water.* His first exclamation was, "Doctor, you have forgotten to turn on the current ; I don't feel anything." But finding all right, I continued the application until he began to feel the electricity darting into the eye back and forth, until presently he exlaimed, "I feel it all over the eye now, and can see light." The feeling, he said, was delightful. He was led home, and slept as he had not slept for months, and without the least attention to his eyes during the night. He attended the clinic regularly, and would frequently say that his eyes felt like they had lumps of ice upon them.

Another discovery in this case was the fact that, by electricity alone, the fever and inflammation were so effectually removed that the patient became alarmed lest his eyelids were frozen, as they felt so cold.

The point I wish to present in these two cases is the insensible nerves in one case of congestive neuralgia, in the other of chronic conjunctivitis, of twenty-five years' standing, and of corneitis, with ulcerations of indefinite duration, and the complete immunity from pain in both cases, as soon as that insensibility was removed, and also to the entire removal of inflammatory action by electricity alone, no medication being allowed, either local or general.

These cases taught me that painful inflammatory diseases were most likely confined to individual nerves, and that these nerves were themselves insensible while producing so much suffering, which view seems paradoxical ; but its truth will be tested.

A lady, Mrs. Cook, who has been an invalid for twenty-six years, a subject of

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* Our No 5. Tip Battery Apparatus was used applying current from posts D E, and positive pole on parts affected.—J. K. Mf'g Co.

rheumatism for twelve years, wheeled about our town by hand for many years, frequently applied at my clinic for relief from her sufferings, called my attention to tender spots near the elbow, which I found to be in the track of certain nerve trunks, viz.: ulnar and radial.

On each spot indicated I placed a steel electrode, and, pressing it firmly, found it pleasant to the patient, and, taking the course of the nerve, I traced it out through its bifurcations to the tips of the fingers; and while tracing accurately, the steel was not only not painful, but pleasant, always eliciting the gratitude of the patient; but on varying the one-sixteenth of an inch from the nerve track, caused an exclamation of pain. The fingers were much distorted, stiff and partially anchylosed. The right index was so drawn as to overreach the next two to it, so that the patient used the thumb and the second joint or knuckle of the index in sewing. The anterior aspect of the index was perfectly anæsthetic or insensible to the electric current, but after using the steel electrode thirty minutes I asked her to try to move it. With the effort the finger commenced to shake, and finally moved around into line with its fellows, and the patient uses it now as other women in sewing.

I now find in every case of chronic rheumatism and neuralgia a dead or insensible nerve, at or near the painful spot. It may have tactile sensation, but to the electric current it is indifferent. The first sensations produced by a concentrated current are pleasant, then warmer on to burning, until the instrument must be removed on account of intensity of heat or burning sensation; and the pain is banished at once and the limb or joint is ready to move in any and all natural directions.

I have now treated a sufficient number of cases to satisfy myself of the facts and views as stated, and that all cases of neuralgia or chronic rheumatism or muscular rheumatism may be cured almost instantly if the nerve implicated is accessible or can be found.

Electricity for the Relief of Tinnitus.

Dr. H. L. Morse, writing to the *Boston Medical and Surgical Journal*, concerning the treatment of ear diseases in Vienna, says: "Another method employed to mitigate tinnitus, which is often so annoying, is the use of electricity. The constant current is at first tried, and if this fails to accomplish the desired end the induced current is used. The anode (positive pole) is placed upon the tragus, and the cathode (negative pole) is brought in contact with some other part of the body, usually the side of the neck or the hand. A very weak current is at first applied, and its strength is gradually increased, until the patient feels a sharp stabbing pain in the ear, or has severe tinnitus; the strength of the current is then gradually diminished until it is once more at zero, before removing the poles. The improvement due to electricity is sometimes permanent—often only temporary—and in some cases it has no effect upon the tinnitus. But even in these last cases it often relieves the dull, stupid feeling in the head, loss of memory, etc., complained of by these patients, and in this way greatly improves their condition. Electricity is also very often used by Urbantschitsch for otalgia, and gives very good, and in many cases, permanent results."

Static Electricity as a Preventive of Cholera.

(*New York Medical Times*, Jan., 1885.)

In a recent number of the *Progrès Médical*, M. Romain Vigouroux, after speculating at considerable length respecting the preservative influence of ozone, formulates the following conclusion:

According to data generally admitted in regard to the prophylaxis of cholera, static electrization practiced daily is the means of which the efficacy is the most probable. It acts at the same time by producing an antiseptic *par excellence*, ozone, and by stimulating all the functions of the organism, and especially that of nutrition.

Treatment of Blindness and Deafness Resulting from Cerebro-Spinal Meningitis.

By Edward C. Mann, M.D.

(*New York Medical Abstract, January*, 1881.)

The blindness and deafness resulting from cerebro-spinal meningitis have generally been considered by the profession as incurable. We have been led to the study and investigation of this class of cases by a very fortunate result obtained recently in a case of blindness, which will be detailed further on, in which, by patience and perseverance in the treatment, sight was finally restored; and the results gained in this case, by the use of the constant current, have led us to believe that these cases are not all incurable.

I was much surprised when a patient of mine told me recently that an eminent oculist told her that she could allow an electrician to use the induced or Faradic current for her child who was deaf as a result of cerebro-spinal meningitis. Naturally enough she got nothing but a very disagreeable effect, with no benefit whatever. There is a great difference between the chemical and catalytic effects of the galvanic and Faradic current. The former current possesses them in a very high degree—the latter has no chemical action in solution of salt, water, solutions of albumen, etc. Ten years ago I commenced the study of electro-therapeutics and can to-day, from almost daily experience with both currents in nervous diseases, state positively my firm belief in what Niemeyer stated in 1870, that, "in the constant current we have a means more powerful than any other of modifying the nutritive conditions of parts that are deeply situated."

The most interesting case was that of blindness so complete that all the oculists of eminence in the country to whom the patient's parents had taken her had pronounced the case absolutely incurable.

My treatment consisted in hypodermic injections of nitrate of strychnia; phosphorous and cod-liver oil internally, and the constant current of electricity applied several times a day at first, for a few moments each time. I soon improved the general health, which was much impaired, but worked carefully on the case for some weeks with no appreciable benefit to the sight, so far as I could discover. One day, about eight weeks or more after her admission here, I was applying the constant current through the optic nerve, she exclaimed, "Dr. Mann, I can see a flash of light." Up to this time the retina had not responded at all to the constant current. She described the light as appearing like heat lightning. From this time on there was steady improvement, and at the end of about six months' treatment I sent my patient home so well that she could see to thread a cambric needle. My idea of the pathology of this case was that we had optic nerves bound down by an organized exudation and that this disappeared, and that the atrophic and degenerative channels also disappeared as the effect of the constant current of electricity.

We believe that the results of our investigation in this direction will lead us to be able to class blindness and deafness resulting from cerebro-spinal meningitis among the curable forms of diseases of the nervous system. There are also chronic congestive states of the brain which tend to mental disorder if not checked, where, in my opinion, we have in the constant current of electricity the very best therapeutical means of cure. The vessels of the dura mater and pia mater and of the brain itself are habitually dilated in these cases and we have to get a tonic contraction of these vessels if we are to cure our patient. By using the positive pole at the level of the first cervical vertebra and the negative at the level of the superior ganglion of either of the cervical sympathetic nerves we can get this result. Two things must be observed in order to be successful: first, long continued treatment; and, second, the avoidance of an injuriously strong current. It is well to use a slowly interrupted galvanic current to promote vascular contraction. —*Complete in N. Y. Med. Gaz.*, Dec. 4, 1880.

The Electric Bath.

(*Quarterly Epitome*, Dec., 1882.)

The administration of electricity by baths is not difficult. An ordinary bath-tub has often been used. It is better, however, that the tub be of some non-conducting material like wood. A double-cell Faradic battery will furnish quite enough electricity. The electrodes should be large, made of metal or carbon, and should dip several inches into the water. The patient lies in the tub so that neither electrode touches him. The current is passed generally from one shoulder to the opposite foot. It may, however, be localized. The general effect of the current can be strengthened by adding salt, soda or an acid to the water. The baths are generally given for from ten to twenty minutes and repeated alternate days.

The claim for the electrical bath is that it is the best way to apply general faradization. It is certain that by the influence of the warm water the skin is made a better conductor. It is well known that the dry skin opposes immense resistance to electrical currents, and that it is largely by virtue of its pores that electricity passes through to a sensible extent. The warm bath moistens the skin, dilates its ducts, stimulating at the same time the cutaneous vessels and glands. The conditions are thus favorable for the so-called catalytic actions of the electrical current.

The objection occasionally made that water is a poor conductor, and hence not suitable for electrical action, is quite trivial. The resistance of pure water as compared with that of mercury is about 120,000,000 to 1; that of salt water, however, is better by only five or ten millions, and the resistance of salt water is nearly the same as that of the moist tissues. In other words, water is a vastly better conductor than the skin under ordinary conditions.

There is no reason *à priori*, therefore, why the electrical bath should not be useful, and we have referred to the matter at some length because it is quite possible for the general practitioner to prescribe and use it as well as the specialist.—*Med. Record*, Oct. 7.

Electricity in Insanity.

From paper read by A. M. Roseburgh, M.D., Surgeon to the Toronto Eye and Ear Dispensary, before the Toronto Medical Society, Dec. 1st, 1881.

The first systematic use of electricity in the treatment of mental diseases, according to Althaus, was made in France in 1845. Teilleux and Auzouy found that, although it was no specific, it nevertheless did good in well-selected cases. Remack and Benedict report favorably of its use, and Dr. Arndt of Griefswald, who has given special attention to the subject, asserts that electricity is an invaluable remedy, of equal importance with quinine, iron and baths, and of far more importance than narcotics, in the treatment of insanity. In 1873, Drs. Williams and Newth of the Sussex Lunatic Asylum, and Dr. Bryce of the Alabama Lunatic Asylum, reported favorably of the use of electricity in mental diseases. Dr. Bartholow states that the treatment of psychical disorders by electricity has been productive of some very striking results; and Drs. Beard and Rockwell predict that an important future is in store for the scientific and faithful use of electricity in our public and private asylums.

Up to the present time, the best results seems to have been obtained in those forms of insanity associated with or dependent upon debility and nervous exhaustion. Arndt recommends "peripheral faradization" (general faradization), and Bartholow—a modification of galvanization. Beard and Rockwell recommend central galvanization as the best means of influencing the central nervous system, and in cases associated with bodily depression, they would alternate central galvanization with general faradization. They make the first tentative applications very cautiously, and the strength of the application and the time of sitting gradually increased, as the patient is able to bear the treatment.

Dr. Clifford Albutt, of the West Riding Lunatic Asylum, Leeds, uses galvanism in acute primary dementia, in mania, and in atonic melancholia. He states that in mania and in atonic melancholia, distinct improvement takes place, and that in acute primary dementia the improvement is marked.—*Quarterly Epitome*, March, 1882.

The Early Management of Infantile Paralysis.

By G. Betton Massey, M.D., Electro-Therapeutist to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases.

The following is from a paper published in the proceedings of the *Philadelphia Clinical Soc.*, February 22, 1884:—It is to the first stage and its diagnosis that I wish to call especial attention. The child, from one to three or five years of age, in perfect health, is suddenly attacked with intense fever. The diagnosis of the acute attack may be summed up under four points, viz.: 1st, sudden motor paralysis, usually of one or both legs, subsequent to fever—possibly in its absence; 2d, absence of any disturbance of sensibility; 3d, absence of paralysis of bladder or rectum; 4th, absence of marked cerebral disturbance other than that due to the febrile movement.

Having properly diagnosticated the case, what should be done to relieve the little sufferer and lessen, if possible, the threatened deformity? If called in at the outset, institute without delay an active antiphlogistic treatment, directed to the seat of the disease in the cord. This should consist of blisters on the back, over the lower dorsal and upper lumbar vertebræ, if the case be the usual one of paralysis of the lower limbs; higher up, at the nape of the neck, if the shoulder or arm is affected; revulsives to the extremities; low diet and appropriate constitutional treatment. No electrical applications should be used at this time, except possibly for purposes of diagnosis, since the condition is one of acute irritation. Such would be the proper treatment for the first four or five days. After that time, and when the blister has healed, gentle, continuous currents (galvanic) of two or three minutes' duration should be applied to the back, and the regular galvanic applications to the muscles be begun. These should consist of the galvanic current so interrupted as to produce contractions when the poles are applied close together on the muscles.' No more current should be used than is necessary to obtain motion; and, since the reaction of degeneration is always present in the early stages, it will be found that placing the anode above will insure the greatest activity of the muscle with least pain. It is by no means necessary to make each muscle contract separately, but careful attention should be bestowed upon the physiological groupings of muscles, in order that those that are naturally associated in movement should be simultaneously acted upon. The galvanic form of electricity only should be used; and I cannot here too strongly condemn the usual prescription of faradism for such cases as unscientific and totally useless. Even if galvanism fails to produce contraction, the well-known electrolytic and catalytic effects of this current make it of great service to the paralyzed muscles.

The sittings should be repeated thrice weekly for months at a time, and should be alternated with thorough professional massage, if possible. Under such a régime, and with the prescription of small doses of strychnia in late stages, it is certain that the paralyzed member can be kept nearer to the condition of its more quickly growing fellow by persistent and careful treatment. If neglected during the first years, the loss of time is irreparable.—*Quarterly Epitome*, June, 1884.

Asthma.

Dr. Peter Eade, F.R.C.P. (*Brit. Med. Jour.*), reports a case of asthma relieved by galvanization of the neck after the failure of numerous remedies. Adopting the views advanced by Dr. Yeo, that asthma is probably an irritation and reflex neurosis, often complicated by swelling of the laryngeal, pharyngeal, or nasal mucous membrane, causing pressure on the vagus or other nerves in connection with the respiratory tract, he uses the current in strength sufficient to be felt. "It should be applied to the throat in the situation of the great nerve-trunks, the vagus or sympathetic, each pole being applied just below the angle of the jaw and in front of the sterno-mastoid, and must be felt as passing through the soft palate from one side of the throat to the other."—*Med. Bulletin*

Writers' Cramp and Analogous Conditions, which are met with in Tailors, Telegraphists, Pianists, Milkers and others.

(*Quarterly Epitome*, Sept., 1881.)

This and allied defects, from overuse of certain muscles, are more successfully treated by galvanism than by any other means. With galvanism must be conjoined rest and systematic gymnastic training. Indeed, without rest no improvement can take place in the condition of the affected muscles. The state of the muscles in writers' cramp varies in different cases. There may be cramps of the muscles concerned in the prehension of the pen; there may be a condition of fatigue and exhaustion, or some of the muscles may be paretic. Some of the cases are local and muscular; some are local and nervous, and a small proportion have their origin in intra-cranial lesions, in changes in the motor and co-ordinating centres. It is obvious that the treatment must be adapted to the conditions present. As most of the cases are due to muscular fatigue and cramps, the most appropriate remedy is galvanism; but this must be conjoined with rest, massage and gymnastics. The anode should be placed over the cervical plexus, and the cathode brushed over the muscular groups in turn from the shoulder down. If the defect is confined to the thumb and finger muscles, to the thenar group, the interossei, and flexors of the fingers, the applications should rather be confined to those parts and consist in the descending labile current. If the lesion consists in relaxation, paresis and degeneration of any of the muscles, faradism may then be employed with advantage. Duchenne's electrodes are best adapted to cases requiring application to individual muscles. Those affected must be selected out, and a current, of strength necessary to induce contractions merely, passed through them. Under no circumstances ought the muscles be tired, either by the strength or duration of the applications. Treated in accordance with these principles, recent cases of writers' cramp may be cured or ameliorated.—*Bartholow's Medical Electricity.—Maryland Med. Jour.*, June 1.

Complete Aphonia cured by Faradization.

By Robert Torrance, L.R.C.P.

(*New York Medical Abstract*, August, 1881.)

Miss A. P., æt. 24, October, 1880. Looked delicate but did not complain of weakness. Had had an ulcerated sore throat, and lost her voice on leaving a heated room in November, 1875. Recovering from the sore throat, her voice did not return. Consulted several eminent practitioners, but result was the same. Preparatory to my making a laryngoscopic examination, the fact was proved that the loss of function was not due to hysteria, as placed completely under chloroform she did not speak, but continued to whisper. The instrument then showed that the vocal cords were in a very relaxed state, and crumpled up as it were near their middle; but otherwise apparently quite healthy. The cords were faradized by McKenzie's electrode, when after very few applications of the electro-magnetic current the voice was partly restored, but as a very harsh "croak" at first, and very monotonous. Was asked to sing over a scale of music, but every note was pronounced in the same tone, and she could not modulate her voice either piano or fortissimo. After current had been repeated at gradually lengthening intervals, however, the voice was permanently restored, and now she speaks in a clear and natural tone. She was seen a few weeks ago, and I heard from her own lips that the cure had been permanent.

Remarks.—This patient had previously given everything prescribed for a fair trial. Tonics and zinc pills were persevered in for a very long time, as well as the inhalation of vapors impregnated with volatile principles. Powders were introduced by insufflation, and this again followed by various escharotics, but without the least benefit until the vocal cords ware faradized, which proved there had been no structural disease, but that the case resolved itself into one of functional aphonia or vocal weakness.—*Lond. Lancet*, July.

Electricity in the Treatment of Diphtheria.

By G. K. Smith, M.D.

(*New York Medical Abstract*, Sept., 1881.)

I do not say electricity will cure every case of diphtheria. Saw a lady last winter, and attended her in confinement. When child was about a week old she was taken with diphtheria. She said she had diphtheria. She knew just what she had, for she had had diphtheria twice already. Used electric battery, and every time I used it she felt much relief. Strength kept up, notwithstanding confinement was so recent. When she was just getting well she made the remark, "I am so weak that I have hardly had strength to get up-stairs." Applied electricity, and there was a flow of mucus from the glands, and she said: "I feel almost as strong as I ever did." Used electricity twice a day, and that woman kept along and did considerable work, and after each application was comparatively stronger.

In regard to the method by which I apply electricity.

I place the feet of patient in water as hot as can be borne with comfort, and put in that water one, two, or three tablespoonfuls of saleratus. Then take a glass of cold water and put some saleratus in it, and with this solution wet the electrode which is to be applied to the throat. The negative pole of the battery is put into the bath in which the feet are placed. The positive is to be covered with cotton and used in the throat, on the tongue, and in the nose if needed. The sponge handles or ordinary electrodes cannot be used in these localities; but a very convenient one for the mouth and throat is made by covering the blade of a dinner knife with a thin layer of cotton, soaked with the solution of saleratus. The cotton also serves to keep the soft parts of mouth and throat from direct contact with the metal, which otherwise would cause pain. Mouth should be kept open, so that teeth will not touch the electrode. A convenient electrode for the nose is made by winding a thin layer of cotton on a wire. Thus prepared, the patient is seated in a chair, if able to sit up. Feet are placed in the bath, and patient holds in his lap a basin to catch the saliva as it flows or as he has occasion to spit it out. The physician should not sit in front for fear the patient will cough and blow his poisonous secretions in his face. Sitting near the right side, he dips the electrode into the saleratus water to wet the cotton; then placing it on the tongue, he holds the knife by its metallic handle in the left hand, while he lays the right hand very gently on the sponge of the positive electrode. The current will now pass through the operator, and he can regulate the power of the current to the ability of the patient to bear it without pain. If he wants a stronger current he can grasp the sponge a little tighter. As soon as patient becomes accustomed to the current on the tongue, the operator may pass the electrode gently up to the side of either tonsil. Watching a good opportunity, he can now pass it back to the posterior wall of the pharynx, and even down to the epiglottis. This last position is likely to make the patient cough, and in some instances vomit. In either case mucus in large quantities will be thrown out, and it will become necessary to remove the electrode; but before this is done the current should be broken by raising the right hand from the sponge electrode. The cotton on the electrode should be secured by winding a little thread around it, and the operator should be careful not to let the electrode touch the teeth, as that will cause pain. If the current passing through the operator be too weak, he may bring the positive sponge up and touch the handle of the knife. Electrode must be removed occasionally, to give patient a chance to breathe, etc. Not necessary to use a strong current. Electrode for the nose can often be passed back as far as posterior wall of pharynx.

Was called to see a gentleman who was suffering very much. Had very intense thirst, throat so swollen he could scarcely talk; suggested electricity in the throat; and in a few minutes' time after its use, the man, who was powerful before he was taken sick, said: "I feel almost as strong as I ever did."

The current should be just strong enough to be comfortable, and so that it will not make the patient fear it. Can use it with children, and have done so with marked effect for good. I stated that I provided a glass containing a solution of saleratus and water. I used that for the purpose of dipping the knife in it; then I

apply the knife to the tongue, and almost immediately it seems as if that solution is a solvent of the thick secretions in the mouth and tongue. The mouth is dry as can be, without any secretion, except that which is coagulated on the surface of the mucous membrane. Then, when the knife is allowed to rest on the tongue, there will be almost a stream of saliva running steadily out of the mouth.—*Proceed. Med. Soc. Co. Kings*, Aug.

Lead Colic—Electricity.

Dr. Rothe, of Altenburg (*Mem. Monatsch. f. prakt. Aerzte*), reports the following case: A man employed in a type-foundry recently consulted him on account of obstinate constipation, which had lasted three days and was associated with severe colicky pains. Purgatives had failed to produce the desired effect. A hypodermic injection of morphine was immediately given, and an emulsion ordered containing ten drops of croton-oil to four ounces of castor-oil, a tablespoonful to be taken every hour. After a sleepless night the patient was found in the same condition. A rectal evacuation had not taken place. Several tablespoonfuls of the emulsion had been vomited. A new drastric purgative also produced no effect, and similar negative results attended other attempts to obtain an action of the bowels. Dr. Rothe then determined to use the Faradic current to relieve the spasm and obtain peristalsis. One electrode with an olive-shaped point was introduced high up into the rectum, and the other armed with a rather large sponge was applied over the abdomen and to the lumbar vertebræ. During the ten minutes of application violent contractions of the abdominal muscles occurred, and the patient also complained of severe pains. They soon ceased, however, after discontinuance of the electricity. On the following morning the patient was found to be completely relieved of his former troubles, and stated that a very copious rectal evacuation had taken place very shortly after the use of the Faradic current.—*Med. Record.*—*Quarterly Epitome*, December, 1880.

Impotence—Electricity.

From paper read by Dr. Rosenburgh, Toronto Med. Soc.

(*Quarterly Epitome*, March, 1882.)

Impotence is also treated by electricity. When it depends upon disorders of a general character, such as the immoderate use of sedative narcotics, sedentary habits, or mal-nutrition from any cause, it demands "the general constitutional tonic influence of general faradization." The local treatment is by placing one pole on the perinæum and the other on the testicles (the testicles may be placed in a cup of warm water in which one pole of the battery is immersed). Either current may be used, but the Faradic current is preferred, and the application is not extended above ten minutes. "Impotence, like seminal emissions, may sometimes be treated by connecting the steel sound introduced into the urethra with one of the poles of the Faradic current, thus combining the toning effect of pressure with the toning effect of electricity on the relaxed parts." (Beard & Rockwell).—*Canada Lancet*, Jan.

Electric Current in Neuralgia.

Dr. Rockwell says: "I find the effects of pressure are exceedingly useful. I would not lay it down as a law, but it will be found in the great majority of cases of neuralgia that where firm pressure over the affected nerves *aggravates* the pain, the galvanic current is indicated; while the Faradic current has the greater power to relieve when such pressure does not cause an increase of pain."—*N. Y. Jour. Med.*

Treatment of Singultus (Hiccough) by Electricity.

Dr. Louis Fischer, of New York, reports to the editor the following case: On October 16th I was called to see Miss S., æt. 19, who had been suffering for two weeks from hiccough. The attacks were almost continuous, occurring every three or five minutes night and day. All the various household remedies had been used in vain. I commenced treatment of the case by ordering fifteen grains each of chloral hydrate and bromide of potassium every three hours, without, however, lessening the spasm or producing sleep. Learning that her bowels were constipated, I gave an enema of soap and water, which produced several copious alvine evacuations. I then continued the bromide and chloral treatment, applied a strong sinapism to the epigastrium, and administered morphia hypodermatically morning and evening in addition. This, too, was without any noticeable effect. The hiccough remained as bad as ever. Pressure on the abdomen was then tried, and found to be equally unavailing. I finally, as a last resort, passed a strong galvanic current through the diaphragm, keeping up its application until the patient said she could not bear it any longer. I then gave her a full dose of bromide of potassium, after which she fell into a refreshing sleep, for the first time since the attack began. She awoke in a few hours completely relieved, and has not had any further trouble.—*Medical Bulletin*, Feb., 1885.

Spermatorrhea—Constant Current.

Dr. Emil Neumann.

(*Quarterly Epitome*, Sept., 1880.)

S. S., aged thirty, consulted me November 25, 1878, for spermatorrhea of a year's standing. The affection, at first trifling, gradually became so severe that several emissions occurred each night, and the defecation and micturition were accompanied by a loss of semen. The slightest friction on the glans penis caused the ejection of the spermatic fluid. The erection became gradually less complete, and there was not the slightest pleasurable sensation during the orgasm. The patient was pale, emaciated, complained of headache, dizziness, disturbance of vision, and great uneasiness when exposed to a clear light. Cause of the affection, onanism. Potassium bromide, valerian, ergot, and the effect of hydrotherapy were tried in vain. I then used the uninterrupted current, applying the negative pole in the sacro-lumbar region and the positive pole in the perinæum for four minutes each day. In three weeks the daily emissions ceased, and the nightly emissions became less frequent and copious. Only three applications a week were now deemed necessary. In the following eighteen days only one pollution occurred; and after the galvanic current had been used sixty-eight times the affection entirely disappeared, and the general condition of the patient was excellent.—*Louv. Med. News*, July 24.

Absorption by Electricity.

(*Medical and Surgical Reporter*, Nov. 14, 1885.)

The French correspondent of the *Medical Press*, October 7, says: "At the Académie de Médecine a member read a paper on the introduction into the economy of certain medicines by means of electricity. If an electric current be passed through a solution of a salt, the salt is decomposed; the metal goes to the negative pole and the metalloid goes to the positive pole. It is this operation that the author succeeded in accomplishing through the organism, and to which he has given the name of electrolysis. In the case of iodine, he applies to a part of the body a piece of wadding steeped in a solution of iodide of potassium, and then places on it the negative pole, while the positive pole is placed on any other part of the body. The iodine separates itself from the potassium, and is eliminated through the organatic tissues towards the positive pole with great rapidity, as may be proved by applying a piece of starched paper, which becomes blue. The author affirms having by this method cured several cases of chronic rheumatism, uterine fibroma, and a case of rheumatic ovarian neuralgia.

Sciatica Cured by Faradization—Three Sittings.

(*American Medical Digest*, Sept. 1884.)

Dr. H. B. Fay, of Washington, sends us the following translation: Dr. L. Duval writes to the *Abeille Medicale*, of Paris, July 21, 1884, concerning his own case, as follows: On the 14th of June, at eight o'clock, as I was about to go out to visit my patients, I was suddenly seized with a violent pain in the centre of the calf of my right leg. This soon attacked the entire outward surface of the leg, becoming a dull, continuous pain, like that caused by a bruise. Upon the slightest movement it grew more intense, especially if I tried to rest the foot upon the ground. It compelled me to take to my bed and preserve the most absolute quiet. There was complete absence of fever. Toward evening the pain, which had not ceased for a single minute, moderated somewhat under the influence of terebinthine narcotics taken internally. I passed half of the night tolerably well, the other half in pain from two violent attacks. The next morning, with a sensation of numbness rather than of pain in the limb, I attempted to take some steps, but soon perceived that a new attack was forthcoming if I did not again take to my bed. Then, with the prospect of being confined as on the previous evening, the idea recurred to me of having recourse to a remedy too much neglected in practice. I refer to faradization. At a quarter of ten I took a sitting of some minutes. The result I can say was marvellous. At half-past ten I was able to get up and walk without the least trouble. On the 16th and 17th of the month, as a precautionary measure rather than from necessity, I took a second and third sitting. To-day, June 25th, my cure is perfect.

This disease, which commonly does not last less than two weeks, has been literally *throttled* by the electric action, whose efficacy and rapidity is much preferable to that of the divers remedies employed externally and internally against this painful affection.

I publish this simple note in order to draw the attention of the profession to a therapeutic remedy which would be susceptible of rendering most valuable assistance, but is not sufficiently used in practice.

Electricity in Amenorrhea.

(*Quarterly Epitome*, March, 1880.)

Electricity Dr. Golding-Bird considers the only direct emmenagogue we possess, and that it always excites menstruation where the uterus is capable of performing that function. Electricity is especially valuable as an emmenagogue in young women, where the menstrual function has not yet been fully established in consequence of a torpid state of the vasomotor nerves of the ovaries and uterus; and also when the catamenia have been suppressed after labor, or in consequence of a chill or emotion.—*Louv. Med. News.*

Treatment of Excessive Perspiration of Hands and Feet by Faradic Current.

(*The American Homœopath, Jan.*, 1881.)

As this symptom is due to disordered functional activity of peripheral nerves, Dr. Gordon was led to study this particular condition, with the following results: The tactile and Faradic sensitiveness of these parts is diminished; their temperature is lower. Systematic faradization controls the perspiration, and corresponding to the effect of treatment the above two conditions are relieved.—*Wratch*, 1880, No. 20.

Wrist-Drop from Lead Poisoning Cured by Electricity.

By Edwin De Baun, M.D., New York.

(*American Homœopathist*, April, 1885.)

While at the Homœopathic Hospital on Ward's Island a very interesting case came under my supervision. It was that of a man who had been employed for years as a type-setter in a large newspaper office.

He related the occurrence of his trouble as follows: "One morning upon dressing myself, I noticed that my right wrist was very weak, with a tendency to drop down. I went to the office as usual, but could not compose with my accustomed speed. The trouble grew daily in severity until my wrist became perfectly helpless. I began the free use of liquor, with a view of preventing further progress of the disease, and in consequence I am perfectly run down in health."

It was discovered upon examination that both the flexors and extensors were involved, one as much as the other, and that paralysis was complete in wrist, hand, and fingers. The parts were cold, very numb, and presented a blue appearance.

He was given internal medication for a long time, allowing each of the remedies laid down in the text-books for this trouble a fair trial, but with no effect whatever. I made the suggestion that electricity be resorted to, which was accepted, and I was allowed to administer it. I used the galvanic current, at first very mild, the minimum number of cells being two, the maximum number being nine cells, commencing with two cells, and increasing one cell a day until nine cells were reached, then decreased one cell a day until two cells were again reached, consuming in all fourteen days, there being fifteen minutes to each application, given twice a day, morning and evening.

The mode of applying the electricity was as follows: One pole of the battery was applied to the spine, in the neighborhood of the origin of the brachial plexus, and sometimes at the base of the skull; the other pole to the wrist and forearm, running it up and down, first one side of the forearm and then the other, occasionally changing the poles from positive to negative and *vice versa*.

On the first one or two applications he could find no change, but after a time the blueness began to disappear, the parts became less numb, and by the fourth day he could flex his fingers very slightly, and by the seventh day the hand was at its normal temperature.

From this on the movements became more marked, the muscles stronger, until by the fourteenth day he had regained normal movement and almost normal strength in hand, wrist and fingers.

I saw him one month later and he was again pursuing his trade.

It may be well to add here that no medicines were given during the electrical treatment.

This case was treated by medicine for almost four weeks before he came under my care, and the trouble first made its appearance about two weeks before coming to the hospital, making in all two months from the onset until he was dismissed cured.

A short time later another case came under my care. It was that of a man employed in the same capacity as the former who had been suffering from wrist-drop for five months. This case was likewise treated with all the remedies suitable for the trouble with no apparent result, the paralysis appearing more suddenly in the latter case, but, unlike the former, was only confined to the wrist, having free motion of his fingers.

The galvanic current was applied in the same manner as in the previous case, but with no effect, though a fair trial was given.

The Faradic current was then resorted to, applying the electricity in the same manner as the former, and after it was used for twenty days, his wrist was restored to its normal motion, remaining weak for a long time, but gradually grew stronger, until he now claims he can use one wrist with as great facility as the other. I saw this case three months later when he was again pursuing his former trade.

This shows the efficacy of electricity in paralysis from lead poisoning, where medicines have totally failed, and further proves, that where the galvanic current cures in one case it is absolutely without effect in another, proving it always advisable to give each current a fair trial.

The Induction Coil,—Its Varieties and the Differential Indications for their Use.*

By A. D. Rockwell, A.M., M.D.

(*New York Medical Record*, November 8, 1884.)

* * * * The first or primary coil consists of a large, well-insulated wire surrounding a bundle of soft iron wire, which forms a magnetic centre. Over this first or primary coil is wound a coil composed of several convolutions of fine, well-insulated wire for the induced current. The terminals of the first or primary coils of wire are united, one end to the battery that operates the coil, and the other to

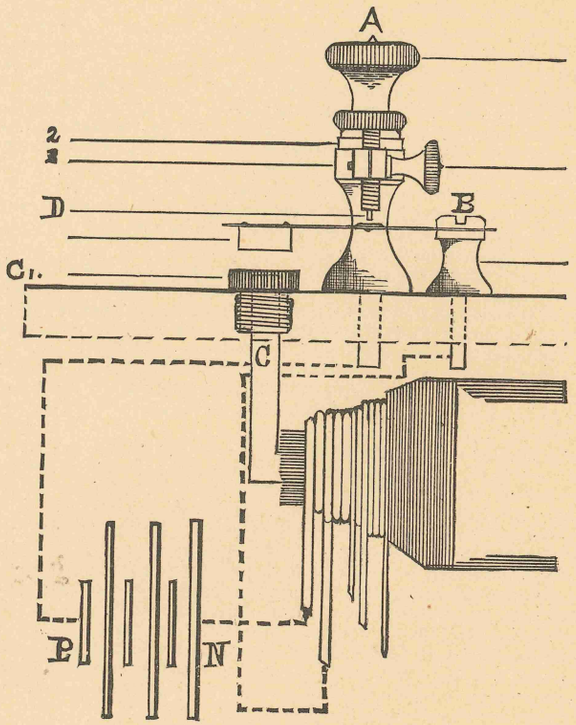

Fig. 1.

the part of the automatic rheotome according to the following description. As the battery is *the* important factor, let us start from it and follow the connections and action of the combinations that produce the effect:

The positive pole (P) of the battery is connected with the governor marked A (Fig. 1). The negative pole N of the battery is connected with the first end of the primary coil, while the last end of the primary coil is connected with the spring support B. The electro-motive force is conveyed from the battery through the

* Read before the annual meeting of the American Academy of Medicine, at Baltimore, October 28, 1884.

primary coil to the spring support B (rheotome), thence to the platina-pointed screw of the governor D, and lastly to the battery, making the complete circuit.

In the centre of the coil and surrounded by the soft iron wires is placed a soft iron rod. One end of the rod is bent at right angles, so that the hammer on the spring is directly over and can move toward this soft iron rod, marked C. When the vibrating spring is resting against the platina-pointed screw D and the battery is connected with the coil, the current, as it passes over the wire of this primary coil, renders magnetic both the centre bundle of soft iron wires and the soft iron rod.

The magnetism is of sufficient force to attract the soft iron hammer on the spring, and draw it down or near to the magnetized rod C.

This movement of the spring severs the connection between the spring and the platina-pointed screw D and opens the circuit. The soft iron rod, therefore, loses its magnetism. The spring ceases to be held down, its tension being sufficient to raise it to a horizontal position, where it again rests in direct contact with the platina-pointed screw D. Again the circuit is closed and the process as described is repeated with inconceivable rapidity. By the action of the battery current, as it is conveyed over the primary coil, and the influence of the magnetized bundle of soft iron wires, a current is induced upon the second coil of fine wire which surrounds the primary coil. This power of induction can be established to the fifth and sixth coil, and further if the magnetic field is properly arranged.

In the ordinary form of induction coil, the terminals of the secondary or fine wire coil are free and in no manner connected with the primary circuit. The influence of magnetism produces a current which we call pure induced.

In the continuous coil apparatus, on the contrary, we not only receive the inductive influence, but the primary influence as well, since it is carried over in combination with the induced currents. Although called a continuous coil, it is really made up of several distinct coils, and each successive coil increases in length but decreases in thickness. These coils are wound over each other, and are connected at different portions of their length, but, unlike other forms, they make direct connection with each other.

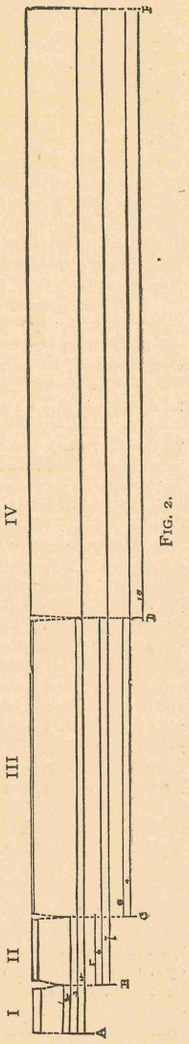

Fig. 2.

These coils (Fig. 2) are, for convenience of illustration, represented by the upper straight lines I, II, III, IV, termed, respectively, the primary, first, second, and third induction coils. The letters A, B, C, D, E represent the different posts of the continuous coil apparatus to which the conducting cords are attached, while the numerals 1, 2, 3, 4, etc., indicate the combinations by which are obtained ten different qualities of current. The short line marked 1, starting from A, represents the current from the short, thick, primary coil marked I. Second line (2), current from the primary and first (I,II) induction coils combined. Third line (3), current from the primary and first and second (I, II, III,) induction coils. Fourth line (4), current from primary, first, second, and third (I, II, III, IV) induction coils. Fifth line (5), current from the first (II) induction coil only. Sixth line (6), current from the first and second (II, III) induction coils. Seventh line (7), current from the first, second, and third (II, III, IV) induction coils. Eighth line (8), current from the second (III) induction coil. Ninth line (9), current from the second and third (III, IV) induction coils combined. Tenth line (10), current from the third (IV) induction coil only.

Therapeutical considerations.—When we consider the many combinations that are possible in the continuous coil apparatus and the different qualities of current that result therefrom, its general superiority over the separate coil is sufficiently evident ; and this superiority becomes more marked if we examine into the varied physical and physiological effects produced by these combinations.

Our object of inquiry, however, is not as to the relative merits of different machines, but as to the comparative value of and the differential indications for the use of the various combinations of the continuous coil apparatus. This point of inquiry, although less important than when it relates to the two forms of dynamic electricity, is yet of no little account, and in some respects has been found to be more difficult of solution.

Notwithstanding the many qualities of current that are derived from the continuous coil, I have, after much observation, reduced to three the number of combinations that seem to be worthy of differential consideration.

Every therapeutic result that can be obtained by any of the ten combinations heretofore considered, will in all probability result from the use of some one of the following :

1. The current from the primary coil as represented by the line marked 1 (Fig. 2).

2. The current from the primary and the first and second induction coils in combination, as represented by the line marked 3.

3. The current from the primary and the first, second, and third induction coils in combination, as represented by the line marked 4.

The primary coil yields a current of large quantity but of small tension, owing to the fact that the wire of which the coil is composed is short and thick. It is worthy of note, however, that this current has considerable chemical power. It will burn iron or steel, giving forth a bright deflagrating spark, and will readily electroplate, an effect not obtainable with any of the induction coils, either alone or in combination with each other. This current is apparently very weak, and induces but slight muscular contractions in the healthy person. In occasional pathological conditions, however, this mild current acts with unexpected energy, producing muscular contractions far exceeding in vigor those that are called forth by the stronger action of the induction coils.

On account of its mild but efficient action the current from the primary coil is preferable for applications to the head and the more sensitive portions of the body, and it will, as a rule, relieve pains of a true neuralgic character, and especially when great tenderness exists along the course of the nerve, far more effectually than the current from any of the induction coils. It is impossible to account for this frequently observed fact, without it be ascribed to a combination of the battery and the inductive influence. When dealing with an agent so subtle and so little understood as electricity, it is difficult to express one's meaning in terms altogether satisfactory, but that such a combination is active and effective is evidenced by the readiness with which electrolytic effects are produced. Asthenopia is a symptom that I have known to be greatly relieved and even cured many times by electricity, but more especially through the use of the primary coil. The tired, aching eye is both temporarily rested after each sitting and permanently strengthened by continued treatment. There seems to be little appreciation, either among ophthalmologists or general practitioners, of the great relief that may follow this treatment in the many cases where the eyes ache severely, if used even for a little time before breakfast or at twilight, or where neuralgic pains exist in or near the eye, or where there is annoyance from muscæ volitantes.

As we include in the circuit with the primary the various induction coils, the current increases in strength with each coil that is added. With the addition of the first induction coil a much greater strength is apparent, but the combination has no marked physical or physiological effects that need detain us. By including also the second induction coil in the circuit, however (line marked 3, Fig. 2), we obtain a current of a peculiar and unique quality. Like the primary coil, it will electroplate, but, unlike it, it will not burn steel or iron. The peculiarity of this combination of the coils is that the maximum of power to contract muscular tissue is here obtained. Each additional coil now that is attached simply gives a decreasing contractile power. While the maximum of current strength is reached in the combination of the primary with the first and second induction coils it is difficult to say, excepting as we ascribe it to the law of harmony or polarization that is brought about by properly conditioning the magnetic centre of the helix, the several coils composing the helix, and the battery influence acting upon the coils. The current from this combination is not at all pleasant ; it is keen and cutting in character, and with its strong contractile properties it is peculiarly adapted to those cases where powerful impressions are called for. Hence in not a few cases of paralysis where the response to galvanism is perfect, but where there is a diminution of farado-muscular contractility, I have found it preferable to any of the other qualities of current to be derived from the continuous coil apparatus.

In superficial forms of anæsthesia it is, perhaps, in no way superior, but in certain persistent and more deeply seated forms of lost or perverted sensibility it is decidedly more efficacious than other combinations. Its greater contractile power over muscular tissue, both voluntary and involuntary, renders it more efficacious in cases of menstrual suppression, and also for atrophied conditions of the uterus, for which so much has been done by electrical methods of treatment. In cases of dysmenorrhœa, as well as in the various neuralgias, my experience leads me to exclude its use. Faradism has been used, and with success, to destroy the fœtus in extra-uterine pregnancy. While I greatly prefer the galvanic current, having always used it without the slightest ill effect, yet if the Faradic is employed I should not recommend the current from the coils now under consideration, but the one presently to be described ; for with this latter form we obtain effects equally destructive to the fœtal life and with less violence to the contractile tissues of the mother. There are several other differential points connected with the use of this series which suggest themselves, but they are of minor importance.

One other condition, however, deserves mention. Impaired virility is a defect for which relief is very often sought. Its influence upon the mind is most unfortunate, and it should be understood that electricity is often of very considerable benefit in these cases. It is sufficient to say that no case which is in any way hopeful should be abandoned until the current from the primary and first and second induction have been tried.

When we include in the circuit not only the primary and the first and second, but also the third induction coil as represented by the line marked 4, effects are obtained more interesting and satisfactory than from any of the other combinations.

These effects are pre-eminently tonic and sedative in character, and give for this quality of current a range of usefulness wider than can be ascribed to the others. There are but few, in all probability, who at this day are unfamiliar with the term general faradization, and who do not understand that by it is meant the application of the Faradic current to the entire surface of the body, from the crown of the head to the soles of the feet. It is in the operation of general faradization, when we desire to obtain the best constitutional tonic effect that electricity is capable of giving, that we resort to this combination of the primary and induction coils. Its action on the motor and sentient nerves is less severe, and its general effects far more agreeable. For the relief of that great army of symptoms that are so familiar and so perplexing to those who have had much to do with neurasthenic cases, there is, according to my experience, nothing to be compared with it. Even the galvanic current by the method of central galvanization, so important in its direct effect upon the central nervous system, falls short of the therapeutic results that follow well-directed applications of general faradization. When persistent failure follows endeavors along this line of electrization, the cause of failure must be ascribed to hasty and faulty methods of administration. In no department of therapeutics is it of more importance to be thorough in detail. He only will achieve the best results who appreciates this fact, who is willing to inform himself as to the *modus operandi* of the methods, and who will devote in individual cases a reasonable degree of time and patience in carrying them out.

Faradism in Disease.

California Medical Journal, Vol. V., No. 12.

In continued fevers the patient becomes worn and restless, in some cases to an extreme degree, and opiates and other hypnotics often fail to afford any relief. Here the practitioner will be put to his wits' end to devise a plan of relief, and this is imperatively demanded that the flagging powers of the system be kept up and the patient tided through.

Even where opiates or other anodynes and hypnotics, as chloral, chloroform, ether, etc., seem to afford relief, it is doubtful if any permanent good results, and it is quite possible that chances of recovery are often abridged through their influence.

The use of Faradism here will prove a satisfactory means of resort, usually affording prompt benefit, for a time at least, and there can be little or no danger of any untoward influence from it. Soothed by its power, if the patient does not go off into a quiet sleep for a little while, he will at least derive enough benefit to enable him to rest comfortably for a time, the tired, aching sensations in the muscles passing off for a brief season.

We would not think of treating such cases without the aid of electricity, and are confident that the reader, if once acquainted with the result, would avail himself of it to great advantage many times.

In administering it, the negative should be held to the feet by an assistant while the positive is applied above by the operator. First, let the negative be held to one foot, while the positive is passed a number of times over the entire surface of the corresponding lower extremity, then let the opposite extremity be treated in the same manner. Now the negative should be held against both feet while the trunk and arms are thoroughly stroked with the positive.

It will be found more convenient, where the current does not irritate the operator, to hold the positive sponge in one hand while the patient is stroked with the other—the current thus passing through the arms and chest of the person applying it. The sensation is more grateful than that of a wet sponge. Here, however, it should be recollected that the current, having more tissues to traverse, should be stronger than in the first instance, that the patient may derive as much influence.

It will be well to repeat these applications twice a day, morning and evening, until the febrile stage passes off, provided they are agreeable to the patient. Whenever they fail to afford a sense of relief they had better be suspended.

Treatment for Felons.

East. Med. Jour.

The application of the Faradic current, the positive pole to the affected thumb or finger, for ten or fifteen minutes, will allay the pain and inflammation. The application should be repeated the next day, and perhaps a third treatment on the following day may be necessary. This treatment in my hands has been sufficient to cure several cases after the parties had lost several nights' sleep on account of the pain, and had been advised to have the finger opened to the bone.

Electricity in Intestinal Obstruction.

Northwestern Lancet, Vol. IV., No. 5. 1884.

There is nothing new in the use of Faradic Electricity for constipation, but the introduction of one electrode high up in the rectum while the other is applied successively to different parts of the abdomen, appears to be a method not in general use. Bloch and Manassein are quoted in the *Journal of Am. Med. Assoc.* as employing this method. The former reports a case of obstipation for eight days, with hiccough and vomiting. After the failure of purgatives and enemata, electricity was used as indicated above. The applications were repeated at intervals of about three hours, each one lasting ten to twenty minutes. The patient's hiccough stopped after the first applications, and his bowels moved after the fourth.

Hysterical Deafness.—Electricity.

By M. Ouspeneky, of Moscow.

M. Ouspeneky, of Moscow, publishes in the *Annales des Maladies de l' Oreille* cases of hysterical deafness. A woman, forty-three years of age, was completely deaf in the right ear for five years, with insensibility of the pavilion and the external meatus; she also suffered from a very troublesome sound of whistling. This deafness came on shortly after an attack of sneezing. There was no existing lesion of the ear, for electricity brought about an almost immediate cure. A hysterical deafness only can be admitted; for the perfectly sound condition of the organ of hearing after five years of disease, as was the case here, can only be observed in cases with that origin.

Apropos to this the author recalls what Briquet says of hysterical deafness: "The diagnosis and treatment of this anæsthesia are so certain," says Briquet, "that one day when a strange lady, I know not by what chance, consulted me for deafness, I was going to send her to more competent persons, when she told me that she was deaf only in one ear, and that was the left, and at the same time she heard whistlings which bothered her very much. This drew my attention. I examined her ear, and found it insensible. I said to the lady 'cross the street and ask Dr. Duchenne to relieve your deafness, and you will return in ten minutes.' She indeed returned in ten minutes, hearing perfectly, after a few moments' use of electricity, and happy to be rid of the whistling which was so troublesome that she always thought that some one was playing a joke, by standing behind her and whistling in her ear.—*Cin. Lancet and Clinic*, April 8.

Electricity in the Treatment of Exophthalmic Goitre.

By A. D. Rockwell, M. D.,

Electro-Therapeutist to the New York State Woman's Hospital.

Dr. Rockwell alludes to eight cases of exophthalmic goitre previously recorded by him as having been treated with electricity, three ending in recovery, and one in approximate recovery; and gives the history of an additional case in which the result was favorable. It would be impossible, he thinks, to obtain similar results in a number of cases by any one method of electrical treatment. In some cases localized galvanization by the ordinary method may prove efficacious. This method may be thus described: Place the cathode over the cilio-spinal center, above the seventh cervical vertebra, and the anode in the auriculo-maxillary fossa, gradually drawing the latter after a few moments of stabile treatment along the inner border of the sterno-cleido-mastoideus muscle, to its extremity. The second step in this process consists in removing the anode to the position occupied by the cathode, and placing the latter over the solar plexus using for a few moments longer a greatly increased strength of current. In other cases currents alternately increased and diminished may prove most effective. The general application of the faradaic current sometimes proves an important factor in the method of treatment. It is not very difficult to believe, he remarks, nor to understand why, general faradization is so effective in lowering a pulse that is rapid as a result of nervous excitement, and in increasing its strength when it is both rapid and weak through nervous exhaustion. It is more difficult to explain why this result is so pleasantly obtainable in cases of exophthalmic goitre in which the galvanic current, after benefiting up to a certain point, fails to do more. The faradaic certainly does not affect the sympathetic so directly and powerfully as the galvanic current does; and we are obliged, for an explanation, to refer to its well-known superior tonic properties, and to the fact that the complete and thorough excitation of the cutaneous nerves by general faradization is followed by a greater and more desirable reflex influence. In a case of over thirty years' standing, which the author recently treated, but in which he failed to cause any appreciable reduction in size, this power of one current to supplement the action of the other was well illustrated. The pulse of the patient was constantly at or above 115. The action of the galvanic current reduced it to 105, but failed to do more than this after considerable effort. General faradization was then attempted, with the result of effecting within a week a further and seemingly permanent reduction of twelve beats. At the same time the patient's general condition was much improved.—*N. Y. Medical Journal*, for June, 1881.

SPECIAL REPORT.

No. XV.—Ophthalmology.

By C. S. Turnbull, M. D., Oculist to the German Hospital, Phila.

From the "Progress of Ophthalmology, during the Second and Third Quarters of the Year 1882, by H. Magnus, of Breslau, and others."—*Archiv. Ophthal.* Vol. XII., No. 1.

[*Translated by* Dr. F. E. D'Œnch, *New York.*]

Remarks on Important Cases. Rep. of the Mich. Eye and Ear Infirmary. *Lundy Removed a Varicose Tumor from a Child by Means of Electrolysis.* The tumor was situated at the root of the nose, and had involved both eyebrows and half of the left upper lid. A battery with 22 elements was used. The introduction of the needles was followed by considerable reaction. Twelve days later they were again applied; at the end of three weeks scarcely a trace of the tumor was left, and the needles were introduced at only one point. The result was perfect, and only a small scar remained.

The Removal of Hairs by Electrolysis.

By Dr. Pliny S. Hayes, of Chicago.

St. Louis Medical and Surgical Journal.

As long as the daughters of Eve vie with each other in beauty, will they try to remove hair from the face. There have been various depilatories introduced, but they rather increase the growth of hair.

Of the methods that have been proposed so far, none is to be compared to electrolysis, which was first used by ophthalmologists, Dr. Michel, of St. Louis, having introduced it in 1875. Piffard, Hardaway, and George H. Fox recommend its use. The apparatus needed is a suitable galvanic battery, of from five to ten zinc and carbon cells, a fine cambric needle, a holder and forceps. The stronger the force of the current, the more rapid is the electrolytic action and the greater the pain. The negative pole is connected with the needle, the distal end of which is that containing the eye. The object is to reach the hair follicle and destroy it, and for this we want as broad a surface on the electrode as possible. The positive electrode is held on the same side. If the patient becomes unpleasantly affected, place a moist sponge near the hair.

The hair is seized with forceps and slight traction made, the eye of the needle being gradually insinuated and carried near the papilla, if possible. The circuit is closed. After the electrolysis has been going on fifteen to thirty seconds, slight traction (half an ounce), is exercised on the hair, and if it comes out, we know that the papilla is destroyed and no hair will reappear. If the hair still remains firm, continue for some time longer and it will come away. If there are many hairs in close proximity, remove the hairs next to the ones first taken out, and so on, as there is a slight area of anæsthesia in this. The follicle heals in a few days, leaving the skin smooth. If this method be applied to a mole or nævus, the tumor will also disappear. Some advocate removing the hair first, whereby they lose the best indication of the success of their operation.

The papilla occasionally escapes destruction, and a second electrolysis will destroy it completely. The hairs that return are less than 5 per cent. of those destroyed. Electrolysis is superior to other methods of depilation, because:

1. It is limited to a minute point.
2. You can destroy rapidly or slowly.
3. You can arrest the process at any instant.
4. The most severe pain is at the time of operating.
5. You can know to an almost certainty, whether you have destroyed the papilla or not.

Note on the Value of Electricity in Some Affections of the Skin.

By G. Betton Massey, M. D.

Electro-Therapeutist to the Philadelphia Orthopœdic Hospital and Infirmary for Nervous Diseases.

Though this therapeutical agent is sometimes referred to in treatises on diseases of the skin, I am led to call especial attention to it at this time from a belief in the infrequency of its employment by dermatologists, and also in order to point out, very briefly, important differences that exist in the indications for the use of galvanism and other forms of electricity.

Now, I do not think that faradaism can ever hold a prominent place in this connection. It is true that we have in faradic electricity, when properly applied, a means for powerful stimulation of the sensory nerves of the skin, yet I do not see that this can be of much practical value in the diseases in question. As a means of physiologically treating anæsthesia, pruritic symptoms, and other sensorial disorders, it is unequalled, but when the disease is intimately connected with alterations of the nutrition, it is manifestly powerless. When faradism is applied to the skin, it should invariably consist of the rapidly interrupted current, and be applied in such a manner as mainly to confine its action to the surface. Such a purpose can be accomplished by selecting any bright, dry metallic surface as the active electrode, some other portion of the patient's body being connected with the indifferent electrode, which should be well moistened. Instead of a smooth surface for the active electrode, I have for some time preferred to use an ordinary wire hair brush so altered as to admit of the current traversing the wire bristles when the brush is connected with the battery.

Franklinism has seemed to me to be similar to faradism in its action on the skin, with this difference, viz,, franklinic sparks have a much more irritant effect, causing first a contraction of the elastic tissue, blanching, and the production of "goose flesh"; followed quickly by a decided relaxation, redness and congestion, which latter condition may persist some hours. A daily continuance of the application will result in the production of an acne-like eruption. I am not aware that franklinism has ever been used by dermatologists, and would merely suggest to them the possibility of this very decided action having a therapeutic value.

It is, however, in galvanism that we have a promise of great usefulness in some of these affections, due mainly to its action in producing electrolysis, as well as stimulating ordinary tissue change, and thus altering the trophic processes in parts acted upon. For this end we can alone rely upon the constant galvanic current, passed with gentleness directly through the diseased portions of skin by a well-moistened electrode, preferably the cathode, the similarly moistened anode being applied to some other part of the body. Its alterative potentiality when thus applied may be readily inferred from a reference to its action in health.

When healthy skin is brought under the influence of the moist poles of a mild current, sensations of burning and tingling are very soon produced, and increase in intensity as long as the current is allowed to continue or remains bearable. This continuous increase in intensity during the application is found with no other form of electricity, and is due to the changes produced in the skin during the passage of the current that tend to make the upper layers a better conductor. As the application continues we have, therefore, an increasing current passing through the circuit, and the increase of pain and redness admonish us that we may lessen the number of cells employed towards the close of the sitting, and yet have a greater amount of current than at the beginning. As a rule, it will be found that the sensation of burning presents an excellent measure of the amount of current passing. Not so, however, with the tingling; this varies greatly in different parts of the body, and in different situations on the same member, and is due to the accidental inclusions of sensory nerves in the influence of the poles. In addition to these sensations, and increasing *pari passu* with the burning, there will be found a decided redness under the poles, gradually becoming wheal-like in character, and, if the application is continued, eventuating in a decided blister.

The time consumed in these changes, taking a fixed number of cells for comparison, depends more on the character of the skin of the individual, or of the part,

than it does on the distance between the poles. As an illustration, it may be said that in most individuals much more current will pass through a circuit including the body from the inner surface of one forearm to one of the popliteal spaces than will pass through a circuit made by placing the poles two inches apart on the back. These considerations are important in connection with therapeutic applications, as conditions of disease greatly alter the conductivity of the derm—generally increasing it—and render a current strength that would be unfelt in health a powerful factor for good or evil.

In regard to the differing actions of anode and cathode on the skin, I will affirm the truth of the following: A more irritant action possessed by the cathode; a peculiar blanching of the skin that precedes the redness under the cathode; and a brighter tint of redness produced by the cathode than by the anode. Beyond these facts I would not at present care to go. As illustrations of the therapeutic value of galvanism in two of these affections, I will append brief summaries of three cases that occurred in my practice:

The first case was the wife of a farmer, who suffered from periodical attacks of intense neuralgic pain in the right hand extending up the arm as the paroxysm attained its height. Coincident with the decline of the attack (generally several days from its commencement) an herpetic eruption would appear at the seat of the greatest pain, occupying an area an inch and a half in diameter in the middle of the dorsal surface of the hand. Occasionally a spot, one inch in diameter, in the middle of the palm would be the seat of the eruption instead of the back. This case being turned over to me, by Dr. S. Weir Mitchell, for treatment at the Electrical Clinics of the Infirmary for Nervous Diseases, careful anodic galvanization was practiced for some weeks, with the result of controlling greatly the eruption. The paroxysms of pain remained as bad as ever, however, and the case was only cured subsequently by division of the nerves supplying the part.

The second case illustrates the therapeutic value of the method in a much bolder light. A prominent member of the profession, in this city, called on me recently with a history of recurring attacks of eczema of the right upper lip. The attacks came on suddenly and generally lasted nearly a month, the lip becoming much swollen, painful, and productive of intense discomfort. Various plans of treatment had been tried by eminent brother practitioners, but all to no purpose. On this particular occasion he was especially desirous of averting the attack that had just begun, and came to me with the request that I would try galvanism. Cathodic galvanization was immediately begun and practiced twice daily for over a week. The first application caused a change in the sensations of the part and started an improvement which culminated in entire recovery a week later.

The third case was more chronic in character, but presents an equally happy termination. The patient, a member of the bench of a Southern State, aged about sixty, had suffered from an eczematous eruption on the right hand for eight months. After fruitless attempts to eradicate the disease his physician sent him to me. Direct applications of the cathode to the diseased surface were begun, the electrode being held in contact as long as a gentle current could be borne—generally from two to five minutes. The patient's time being limited, these sittings were repeated thrice daily for twenty days, at the end of which time the disease had entirely disappeared.—*Medical News*, Jan. 5th, 1884.

Cure of Hydrarthrosis (or White Swelling) by Electricity.

By Dr. Castani.

(*Revue Médicale*, June 7, 1884.)

A patient was admitted to the service of Dr. Castani, of Buenos Ayres, suffering from hydrarthrosis of the knee. After a varied treatment by fly blisters, cauterization, compression, etc., had been tried without success, it was determined to employ the constant current from a battery of thirty-six elements. The result was most gratifying. By the fourth day the circumference of the articulation had been reduced some four-fifths of an inch; on the seventh day no fluctuation could be perceived, and on the ninth day the joint measured exactly the same as its fellow. Walking was difficult at first, but was much facilitated by the application of an elastic bandage.

Organic Stricture.

By Dr. W. H. Dukeman.

From the Medical Record, New York.

Three cases of organic stricture cured by electrolysis are reported in the *Medical Record* by Dr. W. H. Dukeman, of Olean, N. Y. From four to six sittings only were required. No pain nor hemorrhage either accompanied or followed this operation, and the patients followed their usual vocations without discomfort.

The positive pole is placed in the patient's hand or against his thigh, and the negative pole attached to the insulated bougie. When the bougie is pressed against the stricture, begin with a weak current, one or two cells, and increase say one cell a minute, until the desired number of cells is reached. In from ten to twenty minutes the bougie will pass. This should be repeated not oftener than at intervals of from two to four weeks. The doctor has treated twenty-eight cases successfully in the last two years, and is confident that every operator, using proper instruments and ordinary care, may succeed. He uses metallic bougies insulated with rubber except at the point, which is a silver, olive-shaped bulb.

It is known that electricity will decompose fibrous tissues. This can readily be demonstrated by laying a piece of beefsteak on glass and applying the two poles. This agent has long been used to promote the absorption of tumors, morbid growths, etc. This is supposed to be its *modus operandi* in curing stricture.

Intermittent Fever Treated with Electricity.

Electricity has been used by Frank, Borgini, Aldini and others; in these later times by Bossi, of Rome, by Vizioli, of Naples; by Shipulski, Krasnogladof, Deparquet, etc. Prof. De Renzi, of Genoa, has also largely experimented with it, and has found that, in the majority of cases, the fever is stopped, and frequently more promptly than with quinine. In nine cases the author has had five complete cures, two bettering, and two with no success. They were treated with the continued and the faradaic current; the first obtained with nine to sixty-two elements, and applied five to fifteen minutes along the spinal cord. The faradaic current has been more efficient than the galvanic. These experiments have confirmed the possibility of conquering intermittent fever with electricity; but so far, it has been impossible to ascertain why, in some cases, a rapid and complete cure is obtained, and in others an incomplete one, and what are the best means of application of electricity, and when it ought to be preferred to quinine.—*Annals Univerzali.*

Electric Treatment of Strangulated Hernia.

They seem to have in Russia a great deal of confidence in the electrical treatment of strangulated hernia. The *Allg. Med. Centr. Zeit.*, of June 7, 1884, brings the following three reports from the Russian Medical Journal *Wratsch* (transl. *The Physician*):

"Dr. W. Woloshkewitschszk had a patient, in whom an inguinal hernia of ten years' duration had become strangulated. Baths, attempts at taxis, sprinkling of ether over the swelling, all were in vain. Then faradization; after five minutes' application the tumor became smaller, and finally total disappearance of the swelling, with a gurgling noise.

"Dr. Lew reports an inguinal hernia of twenty years' duration, strangulated for fourteen hours. In this case, too, after all the usual means had given no result, the application of faradaic electricity for ten minutes enabled the operator easily to perform taxis. One pole was applied to the swelling, the other to the ring and the neighboring abdominal walls.

"Another case, where the strangulation had lasted eight hours, had an equally favorable result, the tumor disappearing after faradization of fifteen minutes. The operation in the last case was by Dr. Kobktsccihewrsky."

Medical News.—"A hernia (scrotal), as large as a man's head, was completely reduced by Dr. M. Pargamin (*Vratch*) by fifteen minutes' faradization and manipulation, when three hours' taxis had signally failed. The tumor was faradized in all directions."

Sub-Involution.—Electricity.

By Dr. George Apostoli.

At an adjourned meeting of the Paris Academy of Medicine, Dr. George Apostoli read a communication on the above subject. He remarked that at present histology and clinical observation agree in attributing almost all cases of metritis or uterine engorgement to interrupted uterine involution. He, therefore, proposes as a prophylactic agent in an affection which so often follows labor, the adoption of the following new therapeutic method. He thus expresses himself: A woman having been delivered, whether at full term or not, I immediately apply to her uterus a faradic or induction current generated from a coil made from a short, thick wire, and of progressive intensity. In case of normal and full term labor, I renew this operation eight or ten times within about six days. In cases of difficult or premature labor, I repeat it fifteen or twenty times through a period of from ten to fifteen days. My object is to aid, hasten and perfect uterine involution, and thus avoid all the complications incident to slow or deferred convalescence.

I propose the introduction in obstetrical therapeutics, of uterine faradization in every case of labor: First, because it is a wonderful method, of easy application, readily controlled, rapid and energetic in its effects, always harmless, and capable of being applied or discontinued at will; and second, because its immediate effects tend to restore the patient's health, while it ultimately guards against all subsequent uterine complications.—*Med. and Surg. Reporter.*

A New Method of Treating Chronic Rheumatism by Electricity.

By Professor Seeligmuller.

Professor Seeligmüller claims to have met with remarkable success in the treatment of chronic articular rheumatism by electricity. He uses a metallic brush electrode with stift wires, which he connects with the negative pole, the positive pole being attached to a flat sponge electrode. The latter is dampened and placed on the limb near the offending articulation; then the metallic brush is applied over different parts of the joint, being held in contact with the integument in each place for the space of from one to ten seconds. The application is very painful, but the professor remarks that the patients soon grow used to it. After a sitting the skin is covered all over with little dots, looking as if the Baunscheid instrument had been employed. The mode of action the author does not explain, but thinks it cannot be entirely owing to the counter-irritation, for he has used other equally severe cutaneous irritants without meeting with anything near the success obtained by this method. One patient, who had been treated for eight years for chronic rheumatism by all sorts of methods, was able, after the first application of electricity, to raise his arm, which had been powerless for six months; after the third application all the movements were normal. Another man was unable to move either his wrist or his shoulder, owing to rheumatism, and after five sittings was discharged as cured and was able to resume his work as a stone-mason.—*Deutsche Medicinishe Wochenschrift*, October 17, 1883.

Diabetes Insipidus treated by Electricity.

By Dr. C. P. B. Clubbe.

London Lancet [*England.*]

Dr. C. P. B. Clubbe speaks of this method of treating diabetes, in the *London Lancet*. He reports the case of a woman who passed from eighteen to twenty pints of urine per diem. It was light colored, very low specific gravity, and contained no sugar. All the drugs recommended for diabetes were tried, without result. She was then ordered electricity (faradaism), to be applied over the region of her kidneys every day, for about twenty minutes at a time. Under this treatment the daily average amount of urine diminished during six weeks, from 237 to 113 ounces; where it remained nearly stationary, varying but little. At the end of the twentieth week all treatment was discontinued. Six months afterward she was in about the same condition as when treatment was stopped. Dr. Clubbe thinks this result would justify the more extended use of this treatment in diabetes insipidus.—*Med. and Surg. Reporter.*

Opium Paralysis.—Electricity.

By R. J. Curtis, M. D.

We select the following from many cases reported by Dr. Curtis:

Mrs. M., aged 23 years, married to her second husband and mother of three children, drank a pint of brandy during a forenoon and about 12 o'clock swallowed an ounce of laudanum. The servant girl was cognizant of the facts, and when her mistress became unconscious gave the alarm. When I saw her about 2 hours afterward, she was unconscious, surface cold, pulse scarcely perceptible, her head drawn back, eyes open, suffused, and cornea insensible; her mouth open, tongue paralyzed, and respiration four or five a minute and stertorous. I gave her gr. 1-100 sulph. atropia, which was repeated three times during the next 24 hours. The recovery of this case was due to the fact that respiration was kept up by the induced current for over 12 hours. One pole was applied on the neck below the ear, and whenever the other was applied over the diaphragm she would breathe—sometimes breathing two or three times. At the end of about 12 hours the respiratory function was restored, but she did not recover consciousness for several hours.—*Peoria Med. Mo.*, March.

Electrolysis in Aortic Aneurism.

Clinical Lecture by William A. Pepper, M. D., Philadelphia, Penn.

At this point let us discuss the treatment of internal aneurisms. As they are internal and not in reach of the surgeon, so that the main arterial trunk may be ligated, the following medical means have been thought of:

First. Specific remedies, and those that will favor clotting of blood; as the mineral salts, lead, etc.

Second. Physicians, finding that, as people were starved, the blood became very rich in fibrin, thought that there was more likelihood of a clot being formed under a plan of partial starvation than when the patient was allowed full diet.

Third. As all increased muscular exertion causes increased action of the heart, and, hence, the more immediate danger of rupture by the increased force of the blood-current through the sac, rest was considered beneficial. In reality, the last two—namely perfect rest and as low diet as is consistent with absolute life—are most important elements in our medical treatment; and as you never find aneurisms without atheromatous changes in the coats of the arteries, alterative remedies, as potassium iodide, become valuable, more especially when syphilis is an element in the disease. In the case before us, potassium iodide did not check the progress of the affection.

But supposing, despite the treatment referred to, the aneurism goes on growing larger and larger, protruding more and more against the chest, so that the thoracic walls and ribs are giving way before it, the tissues over it are growing thinner, and the thrill and pulsation more evident each day. The question will then come up, and is often anxiously asked by the patient: "Can nothing else be done to relieve me: to ward off this impending result and save my life, just hanging by a thread?" This is often very difficult to answer, except when the aneurism is of a vessel so located that the main trunk may be ligated; but, of course, when situated in the thoracic aorta, or arch of the aorta, this cannot be done. There remains, then, nothing to do but to put something into the sac that, mechanically, will form a clot in it. Needles, horse-hair threads, etc., have been tried with little advantage. The galvanic current alone has proved a success. You know that if two needles, connected with the poles of a battery, be placed in a dish of albumen, it will soon be coagulated. I take here two needles so connected, and by placing them into the white of an egg, you see immediately the needles become coated; and as I continue the process, a firm, strong clot is formed at the negative pole, and a small, friable one at the positive pole. This process has been taken into consideration in the operation of electrolysis.

The mode of operating is very simple. You need two sharp platinum needles, coated with gutta percha; and after freezing the skin with ice or with ether-spray, you should plunge one needle, previously connected with the galvanic battery,

boldly in with a single stroke, until you feel all resistance cease. The second needle is to be introduced in the same way. Thus far, it will cause but little pain; but the moment the current is turned on, the heart will give a great bound and the pulse become greatly accelerated. This should not, however, be any cause of alarm. Gradually turn on the full current and leave it on for some minutes, when the operation is completed by withdrawing your needles.

Electrolysis is only applicable when the medical treatment has been tried, and when the aneurism comes up closely to the thoracic walls; but this is so often the case, that it can be frequently applied. Here is a specimen from a case in which the operation has been performed twice in this hospital, at the urgent request of the patient. The needles were introduced, and almost immediately the operations were followed by great relief of pain and great reduction of pulsation and thrill. In a short time, however, all these bad symptoms returned, and the operation was repeated with the same beneficial results. The man finally died from exhaustion, and at a *post-mortem* examination, large fibrous clots were found at the points of insertion of the needles, which, no doubt, prevented rupture of the sac. The operation, therefore, was perfectly satisfactory, so far as relief of pain and comfort are concerned. The last fact is the same as is shown by the study of the results of about one hundred cases, in whom, in about two-thirds of them, temporary relief from pain and suffering was given, and only in a very small per cent. had it a curative effect; still, in no case had it ever done any harm. I think, myself, that the operation under such circumstances as I have stated is perfectly justifiable, and I would be perfectly willing to have it performed upon myself.—*Virginia Med. Mo.*, March.

Nasal Polypi.

SNARE AND GALVANO-CAUTERY.

Dr. Carl Seiler removes polypi from the nasal cavities with the snare, as this causes less bleeding than the polypi forceps; and touches the bleeding base from whence the tumor has been removed, with the galvano-cautery. This prevents the return of the growth, which nothing else will, the doctor having tried iodine, chromic acid, etc. This procedure certainly merits further trial.—*Med. Herald*, Dec.

Embolism of the Central Artery of the Retina.

ELECTRICITY, BY DR. BENSON.

(*Royal London Ophthalmic Hospital Rep.* x., 3.)

Reports a case of embolism of the central artery of the retina, occurring in a healthy person in whom no cause could be discovered. There was a complication in the shape of a cilio-retinal vessel. The line of demarcation between the œdematous retina round the macula and the normal patch to its inner side was extraordinarily sharply shaped. The fatty changes in the retina occurred with greater rapidity in less than three days. The circulation was eventually completely re-established, and the vision was rapidly restored by the use of electricity. Subsequently, well-marked, small, round or oval white particles appeared in the region of the yellow spot, and in the extreme periphery.—*New York Medical Journal*, Jan. 6.

Electricity as a Galactagogue.

By M. E. LABBÉE.

(*Union Médicale.*)

M. E. Labbée calls attention to the value of electricity as an adjuvant to other means for establishing or restoring the secretions of milk in puerperal women. When the secretion is absent or scanty, or when it has been suppressed from any cause, in addition to other modes of treatment (suction of the nipple, poultices of leaves of the *Ricinus communis*, etc.), it is well worth while to employ a weak current of electricity. The mammary gland is to be compressed between two electrodes, consisting of moistened sponges. A mild current passed twice a day, for from ten to fifteen minutes at a time, will materially increase the functional activity of the gland.—*N. Y. Med. Jour.*

Treatment of Wine-Marks by Electrolysis.

New York Medical Society Record.

The object, as in scarification and puncture, is to excite sufficient inflammation to destroy the fine net work of blood-vessels. A simple needle or an instrument containing a dozen or more needles, with points upon the same plane and about two millimeters apart, is attached to the negative cord pressed into the skin and the electrolytic action serves to destroy the capillary net-work. The instrument used is a small brass disc, which carries numerous fine cambric needles. When the circuit is completed, a blanching of the tissue for a small space around the needles is immediately observed. With ten or twelve cells of an ordinary zinc and carbon battery, the needles should be allowed to remain ten to thirty seconds, depending upon the delicacy of the skin and the effect produced. The blanching disappears in a few moments. The effect of the electrolysis becomes evident in about three weeks. In aggravated cases there might be a return of the color, when a very fine and flexible steel needle, introduced in an oblique direction beneath the skin to the depth of a centimeter or more, should be used. By this means Prof. Fox destroyed the larger vessels from which the supply of the capillary vessels was received. The objectionable features were that the operation was a somewhat tedious and painful one, a slight danger of causing suppuration and superficial sloughs, and a tendency to the formation of small keloidal appearing out-growths, and sometimes small ulcers and depressed scars, or small, firm vascular nodules. The operation does not leave a perfectly normal skin, but the condition may be greatly improved.

Dr. Sherwell, of Brooklyn, thought that the same results could be obtained by multiplied puncture with a needle or disc of needles, the ends of which had been tipped with a caustic, as chromic or carbolic acid.

Dr. Knapp, of New York, suggested that if the starting-point of these marks could be found and destroyed, the remainder would be obliterated. An illustrative case was cited.

Dr. Sherman, of Ogdensburg, cited a case in which spontaneous ulceration occurred at the point, and produced the same result mentioned by Dr. Knapp.—*So. Med. Record*, March.

Weak Heart.

ELECTRICITY VS. CHLOROFORM.

A fact of the greatest importance, practically—especially with reference to the treatment of threatening death by chloroform—has just been determined by Professor von Ziemssen. In investigating the effect of electricity upon the heart, he has discovered that the induced current has no influence whatever upon the frequency or force of the cardiac contractions, whilst the continuous or battery current most distinctly affects them.—*Medical Record*, June 6.

Amaurosis.

ROMAINE J. CURTIS, M. D.

(*Peoria Medical Monthly*, June, 1882.)

R. M., aged twenty-three years, worked in the rail mills, and was subject to extreme degrees of temperature during the "heats." He gradually became blind—could see the largest test type with indistinctness only at a few inches. He had naso-pharyngeal catarrh and sequent vomiting. Steel scales, and carbonaceous matter were always present in the nasal and pharyngeal cavities, where they could be seen by the laryngoscope.

The patient was obliged to stop work, and was treated for his catarrh by sprays, and his amaurosis by galvanism, for six months, when he was discharged cured. The current from five or six cells was generally used, and the positive pole applied over the eye, and the other over the mastoid. The current was tempered by the rheostat, so that during its passage faint flashes could be seen. In this case the retina of the eye was anæmic.

Faradization of the Spleen in Intermittent Fever.

The *London Medical Record*, January 15, 1883, says that Dr. Babaieff regards (*Mediz. Obozr.*, February, 1882) "systematic faradization of the spleen as one of the best adjuvant means in the treatment of intermittent fever, and adduces some cases of his own in which the usual antiperiodic remedies had remained unsuccessful until the electricity had been added. The faradization not only diminished the splenic tumor, but also acted beneficially on the malarial process. This favorable influence the author attempts to explain, as follows: 1. Faradization gives rise to contractions of the splenic vessels, and in a reflex way, acts tonically on the vaso-motor centres. 2. It counteracts blood-stagnation, and possibly accumulation of miasmatic products in the spleen. 3. It acts indirectly on the neighboring kidney, increasing correspondingly the secretion of urine. 4. It prevents the formation of impacts and ruptures in the spleen. The editor of the *Mediz. Obozr.*, Dr. V. F. Sprimon, also testifies to the high value of faradization and galvanization in cases of chronic malarial tumor of the spleen. He saw its prompt disappearance, as well as a great improvement of the general state, in four out of five of his patients treated by this method. In four of the eight of Dr. Sprimon's cases, which presented intermittent of recent standing, and were treated by faradization alone, the fever disappeared and never returned after five to ten sittings (half an hour daily)."

Cure of Paralysis due to Cerebral Hemorrhage.

By Prof. De Renzi.

Authorities differ greatly as to the time after an apoplectic attack followed by paralysis, before commencing treatment by electricity. The general opinion is in favor of allowing some time to pass, so as to permit the absorption of the clot and the subsidence of the inflammatory reaction.

Prof. De Renzi (*Rivista Clinica e Terapeutica*, January 1884), on the other hand, thinks that electricity may be employed, if proper precautions are taken, with the greatest success, a short time after the attack; that is, in the first week. To the treatment by electricity he invariably adds other means to prevent the return of the hemorrhage and the development of inflammatory reaction. These consist in the internal use of bromide of potassium, the constant application of cold to the head, and the administration of some drastic purgative whenever there is constipation. The application of electricity exerts an immediate effect on the muscles, which, in the majority of cases, at once regain their contractile power under the influence of the will. S. P. was admitted suffering from cerebral hemorrhage; on the fourth day of the attack, there was complete paralysis of the left leg. Electricity was applied to the muscles of the thigh, and immediately afterwards the patient was able to bend the limb and to raise the knee for some distance from the level of the bed. On the next day the patient was unable to extend the limb after bending it; electricity was again applied; he then flexed and extended the leg several times without difficulty. On the sixth day paralysis of the toes only remained, and this also yielded to electricity. The application of electricity ought to be practiced directly upon the rapid and spontaneous disappearance of the paralytic phenomena, which is usually noticed in the first days after an attack of apoplexy is arrested. The intensity of the current should be very little, and such that it can hardly be perceived by the observer, touching the rheophores with his fingers wetted in salt water. The interruption of the current must be considerable, the greatest that can be obtained with the automatic interrupting apparatus of the electrical machine. The electrical excitement must be limited to the muscles and intramuscular nerves; therefore, the two rheophores must be applied successively for a few seconds to the fleshy parts of the various muscles. The duration of each application is from one to several minutes. The instantaneous action of electricity in paralysis from cerebral hemorrhage is easily explained by admitting that these paralyses are often neurolytic or suspensive, and that they do not depend on destruction of nerve-elements. The electricity induces in the nerves a negative variation, which extends to the two extremities of the nerve-fibre; so that it overcomes the state of neurolysis determined at the central extremity of the same fibres by the extravasation of blood.—*London Medical Record*, March, 1884.

Faradism in Infantile Marasmus.

By H. T. Webster, M. D.

California Medical Journal, Oct., 1885.

If the experience of the reader has been similar to that of the writer he will readily join us in the assertion that infantile marasmus is a very stubborn condition to influence with drugs. An emaciated infant which has become wan and haggard through imperfect assimilation of food or the prostrating effects of cholera infantum or other depleting disease, and in which digestion is impaired and nervous system disturbed, in which there is almost constantly hectic fever present, with exhaustive alvine evacuations in many cases, passes in time beyond the boundary line where drugs are capable of exerting any beneficial influence.

Such cases slowly waste away and die if the destruction of tissue be not met by proper nutrition, and how to bring about the condition in which this may become possible is a serious problem.

Bottle-fed babies are the most liable to get into this condition, and we may provide nourishment in the form of Horlick's food that will be assimilated when milk disagrees. Fatty inunction may provide a moiety of nourishment from the surface, nux vomica or podophyllia in minute doses may stimulate the vegative functions. Ulcerative states of the intestinal tract may be benefitted by bismuth, epilobium, arsenic, mercurius cor., or bichromate of potash in very minute doses; but all these and other drugs will fail when the system has become markedly prostrated.

Faradism here is capable of establishing for itself a reputation which will stand unrivalled. We have within the last five years been surprised at the results of this remedy in a number of cases, where, judging from former experience with drugs, a fatal issue has seemed inevitable. And it has not been necessary to draw upon the imagination through many weeks of treatment to arrive at the conclusion that electricity was the successful agent. The effects have been prompt and marked, quite evident after three or four applications at intervals of every second day.

To apply in these cases place the positive pole at the feet and the negative pole at the nape of the neck, regulating the current to a mild force, and allow the poles to remain three or four minutes. Then place the positive pole at one foot and hold the negative at the opposite hand for the same length of time; then place the positive at the opposite foot and hand as long. This, it will be recollected by those who have attended our lectures, we term the "tonic treatment." A child that has not rested for weeks will in a few nights after the beginning of this plan rest quietly all night, and begin to gain strength and flesh.

What we prefer to the plan of application above mentioned is the electric bath, when the child will submit to immersion in water, but we desire to avoid a big "squall" on all occasions. People usually have so little faith in electricity as to veto any methods which seem to cause distress.

The Faradic Bath may be administered to an infant in an ordinary wooden laundry tub. In any event the tub should be wood or some non-conductor, not metal. Fill the tub two-thirds full of water at a temperature of ninety-six to ninety-eight degrees, place the child in the water and place the positive conductor into the water at a point opposite the feet, while the negative is held in the water back of the head or neck.

It is to be hoped that no one will attempt to treat a child with a current generated by one of those despicable "crank" batteries. They are too harsh for therapeutic use in any case. *Kidder's is the best faradic battery made, we believe. * * * * The electricity should be generated by chemical agency. Static electricity has its uses, but not in the generation of an induced current. The cheap "crank" batteries are very good toys, but they are mighty poor recommendation for any medical man who uses them to treat disease.

*Jerome Kidder Manufacturing Co.

J. K. M'F'G CO.

Electricity as a Prophylactic and Therapeutic Agent in Obstetrics.

By W. T. BAIRD, M. D., Albany, Texas.

(*American Journal of Obstetrics*, July, 1885.)

PROP. 5.—*That it stands unrivalled as an Oxytocic.*

In all ages and in all climes, efforts have been made to assist woman in her hour of labor; and the higher the intellectual development of the human race, the more ardent and earnest the desire to abridge her sufferings through this painful though physiological process. This desire is the immediate outgrowth of true benevolence, of sympathy and kindness. Where stands that being in human form who can calmly look upon woman—the author of our being, in whose mould of mortality we have all been cast—in the agonies of travail, and not feel and almost irresistible, inborn impulse to put forth his hand, and lend to her a force and an energy which will shorten the time, if only by a few minutes, during which she is to suffer the pangs of maternity? What a pure well-spring of gratitude arises in the innermost recesses of the heart of the humane physician when his inner consciousness tells him that he has been the humble instrument by which these pangs have been abridged! We have no knowledge of a time in which even the most savage nations of the earth have not put forth their brawny hands to assist their females through this painful period. Among "Primitive People," as Dr. Engelmann calls them, this was affected in the simplest possible manner, to wit: by "expressage and massage." By the first method they applied *force* to the fundus and lateral walls of the uterus, by various means, for the purpose of furnishing a *vis a tergo*, and driving the fœtus through the pelvic canal; and by the latter, they, through the irritation produced on the peripheral extremities of the nerves of the uterus and abdomen, increased the force of uterine contractions by reflex action. This is substantially the same process as that which is now denominated "uterine manual pressure," and is regarded by some of our most eminent obstetricians of this age as being the "safest and best oxytocic." More enlightened people obtained the same reflex movements by artificial dilatation of the os, and as mankind advanced in knowledge, they employed various drugs and medicines which were administered to the patient to effect the same purpose. Of these various means, and of these drugs and medicines, it is not my purpose now to write, only to say that up to the present time we still have no one reliable and trustworthy method or remedy to accomplish this much-desired object. Most of the remedies which have hitherto been used for this purpose are now discarded by the most advanced members of the profession; and ergot, the one which has so long stood at the head of this class, is now regarded by many of our most eminent practitioners as "*a dangerous remedy.*" Actuated by this same benevolent impulse which has always warmed the heart of the true physician, Chamberlain, or John Palfyn, gave us the forceps in 1721, and the amount of benefit which suffering woman has been the happy recipient of, from their proper use, is beyond computation. Stimulated to action by this same heaven-born incentive, some of our great and noble-hearted physicians of the present time resort to the employment of the forceps with a frequency which the very boldest of our teachers would not dare to recommend to the general practitioner. Ergot, uterine manual pressure, and the forceps are the only means or measures of any note which are recognized as possessing any true value as oxytocics by our most eminent obstetricians of the present day.

It is true that electricity is, every day, receiving favorable notice at the hands of men of eminence, and I express the hope that the time will soon come when it will receive that amount of recognition from the profession to which its merits entitle it. In Beard and Rockwell ("Med. and Surg. Elect."), we see that "electricity was first used in midwifery by Berthelon and Herder in 1803." This was twenty-nine years before the discovery of the induced current by Prof. Faraday; therefore they must have used either the galvanic current or Franklinic electricity; either of which must of necessity have been generated by means of apparatus which was clumsy, unreliable and inefficient. If they could derive *any* benefit from the exhibition of the agent with such appliances as they must necessarily have had to use in their day, why should *we*

not expect almost perfect results by the proper use of the beautiful and complete machines which can now be procured by any physician living in any civilized portion of the earth?

Channing ("Med. Elect.") says that "one of the most obvious effects of electricity is to produce muscular contraction. The idea of stimulating the contraction of the uterus by this means was therefore an obvious one, and was suggested by Dr. Ramsbottom in 1834, and was, at a later period, introduced into practice by Dr. Thomas Radford." Dr. Radford, in speaking of his first case says: "By this case I ascertained that galvanism produces an effective and powerful contraction of the uterus, and not only so as regards its tonic contraction, but it has also the power of energetically exciting alternate contraction when applied at intervals. The alternate contraction excited by this agent is analogous to, and as powerful as, that which is observed in normal labor and the tonic contraction is greater." He especially recommends it in cases of placenta previa, or in all cases of hemorrhage before delivery, and cites three cases of its successful employment. He used an electro-magnetic (faradic) apparatus, and made the application of one pole to the os and cervix, and the other to the parietes of the abdomen. Drs. Dorrington, Cleaveland, Frank and Henry Wilson are also quoted by Channing, and cases are reported by each in which its employment was immediately followed by success, after the complete failure of all ordinary measures. The cases reported were all cases in which the hemorrhage preceded or accompanied the labor. Dr. Dorrington reports five cases, and says in conclusion, "I believe there is no other means by which we excite uterine contraction, which is not liable to fail when severe hemorrhage has weakened the vital powers."

Prof. J. Y. Simpson has reported a negative result obtained by him in eight cases. "These experiments were made with a powerful electro-magnetic apparatus." Dr. Golding Bird is not willing to admit for a moment the validity of Prof. Simpson's objections in opposition to the experience of Dr. Radford, Dr. Zener, and others. He accounts for the failure of Prof. Simpson by his use of a magneto-electric machine improperly constructed. Dr. West ("Report on Midwifery") says: "These observations of Prof. Simpson seem to have been made with great care, but can hardly, as yet, be allowed to outweigh the results made by Reid and Carns in their experiments on animals, and the recent evidence in favor of the reality of the influence of galvanism afforded by some of the cases which Dr. Radford has recorded." Channing says: "That the effect of electricity, which induces such *powerful* contractions in all muscular tissue, *should be null in the case of the uterus, at a time when contraction has become its special function*, is hardly conceivable." (Italics mine.) Dr. Poore ("Med. and Surg. Elect.") says: "Dr. McRae recommends the use of faradization in the second stage of labor, and quotes cases to show that, after the failure of other means, the current quickly succeeded in producing activity of the uterus." Dr. Martemucci prefers electricity to ergot when there is inertia of the uterus during labor, for the following reasons: 1st. That its contractions are more under control. 2d. That there is less danger to the fœtus from continued pressure on it and the placenta. 3d. That when using ergot the uterus cannot enjoy those periods of relaxation which are so necessary to it." He also reports its successful employment in cases of hemorrhage attending placenta previa.

Beard and Rockwell ("Med. and Surg. Elect.") also devote a chapter to the use of electricity in midwifery, and mention the names of the following renowned investigators who have successfully employed the agent, and highly advocate its adoption. They say that "faradic currents were first used for bringing on labor pains by Hoeninger, Zily, and Jacoby, of Neustadt, in 1844. Since that time the same agent has been used for this purpose by Frank, Dempsey, Barnes, Mackenzie, Tyler Smith, Radford, and others." They also mention the names of "M. De St. Germain, Tripier, and Dr. A. Murray, of New York City."

"Dempsey records a case where, after ergot in large doses had failed, faradization for forty minutes produced uterine contractions that resulted in the delivery of the child." Mackenzie succeeded in stopping the hemorrhage in two cases of placenta previa. In one the current was applied for six, and in the other for three hours. M. De St. Germain and Tripier are highly in favor of faradization in the last stages of delivery. "When the labor has fairly begun, the pains coming on at intervals of about a quarter of an hour, Tripier faradizes the lumbar region. Uterine contractions soon

follow, and occur more frequently, while the dilatation of the neck takes place more rapidly." B. and R. say that "these observers claim that electricity acts more quickly, more uniformly, and with less injurious effects than ergot. During the last two or three years, there has been quite a revival of interest in the use of faradization in midwifery. Quite a number of observers in different countries have reported good results." "Dr. A. Murray has treated eighty-two cases of *inertia uteri*, in second stage of labor, by external faradization, and always with good results. He states that it acts more speedily than ergot."

Althaus ("Med. Elect.") refers to the following additional observers who have tried electricity in obstetrics, and were highly pleased with the results obtained by its use: Stein and Kilian, in Germany; Dr. F. W. Mackenzie, Dr. Kuhn, Mr. Parsons, of Liverpool; Dr. Mackintosh, of Doncaster; and Mr. Parsons, of Islip.

This author also refers to the negative results obtained by Profs. Simpson and Scanzoni, and says that Dr. F. W. Mackenzie's experiments, however, certainly show that in cases of placental presentation, in which profuse hemorrhages continued to recur notwithstanding the employment of the plug and other means, before the os is sufficiently dilated to admit of manual assistance; and in cases of hemorrhage in the early months of pregnancy which resist other treatment, and which, from the constricted state of the os and cervix uteri, do not admit either of mechanical or manual interference, faradization is most valuable. This is corroborated by the experience of Dr. Kuhn, who used the induced current in the case of a woman in whom, eighteen hours after delivery, the placenta had not been expelled on account of atony of the uterus. . . . The circuit had scarcely been closed when the uterus contracted and expelled the placenta. "M. De St. Germain states that he has also found that, whenever labor pains had commenced, occurring at intervals of fifteen or twenty minutes, on the application of the conductors to the lateral parts of the abdomen, in about ten minutes a remarkable increase in the uterine contractions occurs, and that the contractions so induced are much more prolonged and painful than others. The dilatation of the os uteri has constantly taken place with rapidity; and a fact to be particularly insisted upon, especially as it is not noticed by Barnes and Radford, is that the expulsion of the placenta immediately follows that of the infant, being either spontaneously projected beyond the vulva, or capable of removal without the slightest traction."

Mr. Parsons, of Islip, has recorded the case of a woman who, during her seventh confinement, was taken ill with severe and frequent eclamptic fits, with complete cessation of uterine contractions. He applied galvanism (faradization) externally, with immediate effect, the bags of membrane becoming tense, and protruding through the os. Within three-quarters of an hour from the commencement of the application the child was born.

Dr. Georges Apostoli (*Progrès Médical*) concludes from the observation of thirty-two cases (eleven of which were abortions) that faradization of the uterus is always inoffensive. Given the same amount of faradization, the contraction of the uterus is very variable, *being in inverse proportion to its inertia*. Its action, as compared with that of ergot, is much more energetic and prompt.

Dr. Tipiakoff describes the results of faradization, as used in Prof. A. M. Makeef's obstetric clinic in Moscow (*Vratch*, Nos. 24 and 25, 1884). The conclusions at which the author arrives are these: 1st. The electric current is a powerful, as well as a simple and safe means of inducing uterine contractions; hence it is indicated for inducing abortion or premature labor, also in cases of uterine atony and post-partum hemorrhage. 2d. Since the strength of the uterine contractions bears on the rapidity of the dilatation of the os, faradization is indicated wherever a more rapid dilatation of the os is desirable; as, for instance, in cases of hemorrhage depending on placenta previa, or accompanying abortion with an irregular course. At a meeting of the Obstetrical Society of London, held April 21st, 1884. (American Journal of Obstetrics, June, 1884), Dr. Kilner read a paper on *the use of the induced current during parturition*. He says: "The effects of the current are the relief of pain, prevention of fatigue and post-partum hemorrhage, equalization of the pulse, *increase in frequency and strength of the uterine contractions*, and the prevention of vomiting." (Italics mine.) "The author now employs the coil * (shown) in nearly all cases. In about three-hundred

* Faradic Current J. K. M'f'g. Co.

cases, post-partum hemorrhage only occurred twice. The coil sometimes fails to produce uterine contractions when most needed. After its use for an hour, or one and a half hours, it exercises its sedative action, but no longer increases the uterine contractions. In some cases it produces violent and almost continuous contractions. In one case a contraction lasted almost fifteen minutes. No prognosis with regard to these points can be made." In the discussion which followed the reading of Dr. Kilner's paper, Dr. Playfair said that he had "tried the current, and it had proved a failure, perhaps from want of special skill, but if special skill were needed, it could not be generally used. Its effects in diminishing pain were slight, and not to be compared with other means at our disposal. A battery was a cumbrous thing to carry about, and was likely to alarm patients. As an oxytocic, he had found it useless. Dr. Kilner compared its action with that of ergot, which should never be used to accelerate delivery. Uterine manual pressure was the best and safest oxytocic. Dr. Murray thought that if the electric current had such a power as had been described, the possibility of rupture of the uterus would have to be remembered. He had used it for hemorrhage, but considered its value very doubtful. Dr. Kilner replied that, as regards lessening of pain, the current is more under control than an anæsthetic, and never caused sickness. He had never seen a case of rupture of the uterus."

Dr. Allan McLane Hamilton ("Med. Elect.") says: "When we consider that the uterus is a muscular organ, and that, like all other organs containing muscular tissue, it will contract when stimulated by electricity, we must arrive at the conclusion that, in an atonic condition, we may readily make it eject its contents by the application of a faradic current. Electricity is recommended in tedious labor, hemorrhage, or for bringing on uterine contractions in special conditions when they are desired. We may apply one pole over the lumbar region, and the other to the cervix, or, as recommended by Dr. Barnes, both sponges to the abdominal parietes. The current must be mild, otherwise there is great danger of producing the death of the child, or convulsions or other bad symptoms upon the mother. We may claim, as the advantages of its use: 1st. The contractions are more energetic than those produced by ergot. 2d. Its action is immediate. 3d. It can be used when the swallowing is impaired, and the patient cannot take ergot. 4th. The contractions are regular and normal."

The above comprises all the authority on the use of electricity in obstetrics which I have been able to procure, and when I began the use of the agent in my own practice, what is quoted above from Dr. Hamilton's work was all the authority which I had upon the subject, and when I had become somewhat familiar with the effects of the agent in this class of cases, and had begun to arrive at conclusions of my own, based upon my own experience, I was afterwards highly gratified, when able to obtain the opinions of other observers from different countries, to find that so many different investigators, each one pursuing his course independently of all the others, were, with a few exceptions, reaching almost exactly the same results. This to me is one of the strongest evidences of the great value of the agent as an oxytocic, admitting that my own observations are liable to many sources of error. Therefore, when I see that so many who are distinguished for the *accuracy* of their observations, and the soundness of their conclusions, have almost uniformally obtained the same effects from the agent, and come to the same conclusions, I can no longer question its value.

My conclusions, based upon an observation of about 220 cases, may be briefly stated as follows:

1. That it increases the force and frequency of uterine contractions in a remarkable degree. This effect, though denied by Prof. J. Y. Simpson, Scanzoni, and Dr. Playfair, is happily sustained, both by scientific research and the observations of such an array of authors with distinguished names that it may be suspected that the observations of those who have denied it may be open to some source of error. As Dr. Channing so aptly remarks: "That the effect of electricity, which induces such powerful contractions in all muscular tissues, should be null in the case of the uterus, at a time when contraction has become its special function, is hardly conceivable." If electricity possesses an oxytocic property, it is in its power to produce or accelerate muscular contractions of the uterus, and if it can be shown that it is a force which can be exerted upon this tissue, and produce this effect, and that its action is more *certain*, *speedy*, *safe*, *simple*, *and permanent* than any other remedy or measure in use for this purpose, then we may truly say that it stands unrivalled as an oxytocic.

It may be said that these peculiar effects can only be obtained by the use of the galvanic current, but Beard and Rockwell ("Med. and Surg. Elect.") say that "both currents, faradic and galvanic, cause an unstriped muscle to contract in accordance with the law of its physiological action," and again say, "unstriped muscles can also be made to contract by faradization or galvanization of the nerves and nerve plexuses which supply them in direct electrization." These are important points, and should not be allowed to escape our observation, as they apply directly to the successful use of the faradic current to promote contractions of the (unstriped) muscular fibres of the uterus; and in speaking directly of its effects on the uterus, they say that "the uterus of animals and of the human being contracts after the manner of the intestines, bladder, and other involuntary muscles; whatever pole is used, or in whatever direction the current is applied, contraction takes place whenever the current is applied, whether the uterus is or is not in a gravid condition. Both faradization and galvanization have this slow, contracting influence on the uterus." Dr. Poore ("Elect. in Med. and Surg.") says: "Muscle of all kinds, striped and plain, can be made to contract by the application of the galvanic or induced current, but especially the latter. No matter where the muscle be situated, in the limbs or in the walls of an internal viscus, provided that it can be reached by the current, contraction will follow." Again he says: "The physiological action of the induced current is chiefly that of an excitor of nerve and muscle."

Althaus ("Med. Elect.") refers to Prof. Weber, Dr. F. W. Mackenzie, Breschet, Tourget, Tyler Smith, Beck, Kilian, and Barnes, who have investigated this subject and admit that the uterus is subject to contraction through stimulation by electricity. He says: "Opinions differ as to the precise seat of the centre for uterine movements." . . . The last investigator who has observed these phenomena is Dr. W. Schlesinger, of Vienna, who found that faradization of the central end of a spinal nerve, in the rabbit, causes general and energetic uterine contractions within five to fifteen seconds. . . . These contractions Schlesinger looks upon as reflectory, as after section of the cervical cord the uterus does not respond to faradization of a spinal nerve. He is inclined to think that the centre for uterine movements is in the medulla oblongata, and that the propagation of the stimulus to the uterus is affected, not by way of the pneumogastric or sympathetic, but through the spinal cord:

Now it will be seen from the above that the favorable results which I claim to have obtained by the use of electricity as an oxytocic, and the conclusions at which I have arrived, are in accordance with the experience and conclusions of a vast majority of those who have employed it for this purpose, and also according to the principles which are now well established by electric physiologists. I believe that the action of electricity is governed by certain well-defined laws, and that one of those laws is *that an induced current applied to a healthy muscular fibre*, or to the nerve which supplies it, will cause it to contract. Now, if this be true, then it must be conceded that my first conclusion that I based upon my own individual experience is also based upon sound electro-physiological principles. It is impossible to estimate the exact degree of force or the exact amount of stimulation which it furnishes to the uterus or the number of hours or minutes by which the labor is shortened; and this will also apply to any remedy or measure which can be used as an oxytocic. That only negative results were obtained by such distinguished men as Simpson, Scanzoni, and Dr. Playfair only proves to me that the difference in the results must necessarily be accounted for either in the manner of applying it, or in the kind of coil, or the strength of current used. Profs. Simpson and Scanzoni have been answered by abler pens than mine, but I wish to devote a few words to the objections of Dr. Playfair. He says that "perhaps his failure was for the want of special skill, but that if special skill were needed, it could not be generally used." . . . "As an oxytocic, he had found it useless—uterine manual pressure was the safest and best oxytocic." He says, "if special skill were needed, then it could not be generally used." If this is true, then it would with equal force apply to any measure that might be employed in the lying-in room for the benefit of the patient or her offspring. Has not Dr. Playfair himself acquired such a *high degree* of "special skill" in the use of "uterine manual pressure," in the use of the forceps, of the dilator, and above all others, of the "obstetric hand," as to render the very sound of his name pleasant to the ears of every physician who practices the obstetric art in any civilized

portion of the world? For *this* reason shall it be said that the measures which *he* employs and recommends "could not be generally used," because *he* had acquired special skill in their employment? He says "uterine manual pressure is the safest and best oxytocic." Would it not be an improvement on this measure to have the hand that makes it to form one electrode of a good and reliable induction apparatus? The same manipulations and the same pressure could be made with it as though it were unconnected with the apparatus, and then indeed, from that hand, the muscles would receive a stimulus which would produce contractions giving satisfaction to the operator, and benefit to his patient. In cases of uterine inertia, I have never failed to quickly excite vigorous uterine contractions by this method, and that, too, without inflicting any pain upon my already suffering patient.

In Dr. Kilner's paper, he says: "The coil sometimes fails to produce contractions when most needed. After its use for an hour, or one and a half hours, it exercises its sedative action, and no longer increases the uterine contractions." Now this does not accord with my experience with this potent though highly manageable agent. Its sedative effects have always been fully manifest in from one to thirty minutes, and it has *never* failed to promote uterine contractions in my hands when needed. As the abstract of his paper which is before me does not state what "coil" he uses, nor his method of application, I have no means of judging whether the difference in the results obtained by us could be accounted for by the means or methods used or not. In my opinion, when the current is *properly applied*, it is just as certain to produce contraction of muscular fibre, as it is to follow the course of, or be conducted by, a copper wire when it forms a part of the circuit.

2. That this increased force is entirely under the control of the operator. In no one case out of the whole number in which I have used it have I had the least difficulty in regulating the force of the contractions with the current, and in this I am sustained by all the authors on the subject who have recommended its use, except Dr. Kilner, who in his paper before referred to, says: "In some cases it produces violent and almost continuous contractions. In one case a contraction lasted fifteen minutes. No prognosis with regard to these points can be made."

I can merely say, in reference to this experience of his, that it may be accounted for by the idiosyncrasies of the patient, or in the strength of the current used, or in the suddenness with which a strong current is applied. I shall again refer to his experience when I come to speak of my method of making the application. It is this very property of the current which gives it a decided advantage over ergot, and this is mentioned by several of the authors whom I have already quoted.

3. That dilatation of the os is greatly facilitated, thereby shortening the labor in every stage.

This effect I have constantly observed in all the cases which I have treated with the current, and it is easy to see that it follows as a consequence, that, if the current will increase the force of the contractions of the longitudinal and oblique fibres of the uterus, the os will be more rapidly dilated; or, as Dr. Tipiakoff elegantly expresses it, "since the strength of the uterine contractions bears on the rapidity of the dilatation of the os, faradization is indicated wherever a more rapid dilatation of the os is desirable."

4. That it adds a degree of *vital force to every muscular fibre engaged*, independent of the nervous centres, thereby imparting a *sensible* degree of increased strength to the patient, and exhibiting its refreshing and restorative effects, preventing fatigue, shock, exhaustion, post-partum hemorrhage, and muscular soreness.

This conclusion I base strictly on my observation at the bedside of *all* the cases in which I have employed it for its oxytocic effect, and, as it has not been particularly spoken of by the authors whom I have consulted, and whereas I regard it as one of the most important of all the benefits to be derived from the exhibition of this agent in the lying-in room, I hope I will be pardoned if I dwell more at length on it, and for asking special attention to some well-established facts in electro-physiology to sustain me in this conclusion, at which I have arrived after an experience in *not* a small number of cases, and due and mature consideration. When I first commenced the use of electricity as an oxytocic, it was in cases of extreme debility from long protracted previous illness, in cases of exhaustion from ante partum hemorrhage, or in cases of extreme fatigue as a result of tedious labor, and I was at the very outset struck

with astonishment at the wonderful results obtained. In a few minutes after closing the circuit in these cases, the feeble uterine contractions would begin to be supplanted by those exhibiting a greater degree of strength, the weak and frequent pulse would be quickly exchanged for one which was slower, fuller, and firmer, jactitation and restlessness gave place to a condition of refreshing rest, and, as labor progressed, the strength, instead of diminishing, apparently increased, and, at its conclusion, the patient, so far from being in a state of collapse, shock, or extreme exhaustion, indicating an expenditure of all her latent nerve forces, with a weak and flickering pulse, hurried respiration, and a general feeling of great prostration, there would be no apparent collapse, shock, or exhaustion. The pulse would be strong, full, and scarcely more frequent than before the onset of labor, respiration natural, and a sense of increased strength in every tissue of the body. In the first few cases in which I observed these exhilarating effects, I regarded them as accidental, and due, perhaps, to some idiosyncrasy in my patients. Further observation soon proved, however, that they were *not* the result of accident or idiosyncrasy, but that they were *constant*, and in some degree accompanied *every* case in which the agent was employed. At first I expected that I would soon see them followed by a state of extreme depression, as would likely have been the case after the exhibition of an ordinary stimulant, and I expected that when the depressed condition *did* come that the vital actions of the system would fall as far below the normal standard as they had been raised above it. This expectation only showed my extreme ignorance of the vital properties of the power and of the physiological effects of the force which I was dealing out to my patients. I watched carefully in all cases for depression, but it did not appear in one. To simply say I was astounded by these unexpected results does not express the depths of my surprise. I was at a complete loss to account for them, and in my perplexity resorted to all the authorities whom I could procure for a satisfactory explanation. Most of the systematic writers on medical electricity, although recommending its use in cases of labor accompanied with extreme exhaustion, uterine inertia, and kindred ailings, not one of them referred to these highly interesting and peculiarly refreshing and restorative effects. I then did what I should have when first I found myself at a loss to account for the remarkable results of my own experience. I took up the task of reviewing *electro physiology*, and then found (as we often do when we go back to first principles) a full explanation of all the wonderful effects which I had witnessed, but it did seem to me as though expressed by the authors in such a manner as to show that even *they* did not fully realize the vast importance of the truths which they were recording. Instead of boldly ascending the mountain, they seemed to be hesitatingly treading around its base. Although truthfully giving us the results of laborious and carefully conducted experiments, they failed to point out to us where and in what manner they could be made available in practice to relieve extreme debility, and prevent exhaustion.

As set forth in the statement of this conclusion, I now claim that the faradic current will not only promote contractions of the uterus and abdominal muscles, but that it *adds* a degree of *force* to them, which not only enables them more readily to overcome the resistence offered to the passage of the fœtus through the pelvic outlet, but leaves them *refreshed*, *rested*, and *strengthened*, *free from exhaustion or soreness*. This claim I shall attempt to establish by referring to its effects on muscles in other regions of the body where this additional force can be accurately estimated, and I shall also claim that, while we elicit vital action in the muscles by the administration of electricity, we at the same time *conserve vital force in the nerve centres*. Beard and Rockwell say, in speaking of *immediate strengthening or restorative effect of electrization on voluntary muscles*, that "one very interesting effect of electrization of voluntary muscles is to increase their power of doing work." This effect, which was called by Heidenhain and Bruack *restorative*, can be demonstrated in various ways. The capacity of walking, in cases of paralysis of the lower limbs, is sometimes increased at once after electrization; the patient steps across the floor more easily, firmly, and rapidly, or can walk farther; or he can raise the leg higher, and with less difficulty." Now, this accords exactly with my experience with it as an oxytocic, that it increases the power of the uterus and abdominal muscles to perform a greater amount of work in a given time, and that this increase of action is followed by a less amount of fatigue and muscular soreness; or that the effect of the current is refreshing and restorative. Althaus ("Med. Elect."), while referring to the experiments of Heidenhain on the muscles of the frog, says:

"These refreshing effects of the continuous current are of the greatest practical importance, and are shown in the most striking manner in cases of disease, where the actions of the muscles are enfeebled or entirely lost."

Dr. Poore has found similarly refreshing effects caused by the application of the continuous current to the motor nerves of healthy men. "One man could thus hold out his arm for thirteen and one-half minutes with galvanism, and only with the greatest exertion six minutes without." "One said that, when the arm was used for such an experiment without galvanism, it ached all day afterwards, but with galvanism it did not give any trouble. The endurance of voluntary muscular action is, therefore, considerably increased by the continuous current."

The dynamometer is a good means of illustrating the increase of muscular force which can be immediately furnished to muscular tissue by the employment of electricity. Dr. Poore found that "eight successive squeezes of the dynamometer with electrization gave 477 lbs., and whithout electrization 388 lbs., a difference of 80 lbs. In another experiment made, when the hand was not tired by previous experimenting, the difference was even more marked, being a gain of 152 lbs. in six squeezes of the dynamometer." Speaking of these effects, Dr. Poore, says that "there is no more important effect of the constant current than what may be called its *refreshing effect*. . . . *This fact has long remained without any practical application of it.* (Italics mine.) Certain observations of the authors, therapeutic as well as physiological, lead me to hope that the refreshing effects of the current will be found to be one of its most useful properties." How aptly these words apply to our subject, and to me they bear the indelible impress of truth. That "this fact has so long remained without any practical application of it," is, in my opinion, because it has not been generally understood. As illustrating these effects in my own practice, here let me remark that it is my earnest conviction that the patient herself is the most capable of judging whether measures instituted for her relief are effective or not. In almost every case in which I have used it, the patient has cheerfully and gratefully, and in most cases voluntarily, expressed a sense of an increase of strength and relief from pain. * * * * * * * * * The patient herself recognizes and acknowledges the presence of a *force* which is *not* a part of her own being—a power which is furnished her from *without*, at the very instant it is required to prevent an undue expenditure of her own vital forces, and to refresh and restore all of her muscles, which are subjected to an intense degree of contraction.

Now, if we can make these refreshing and restorative effects of the current available in cases of labor, where there is such a vast outlay of nervous force, attended with such exhausting muscular contractions, have we not found an oxytocic which stands unrivalled? Will not the beneficial effects which can be obtained by its use in this class of cases justify the "hope" expressed by Dr. Poore, when he said, "that the refreshing effects of the current would be found to be one of its most useful properties." It will be observed that the earlier investigations refer particularly to the employment of the "*constant current*" to restore and refresh exhausted muscles; but the results obtained by Apostoli, Kilner, Dr. Tipiakoff, and Dr. A. Murray plainly show that the same effects follow the employment of the faradic current. It must be admitted that, in order to determine the restorative effect of the current on muscular fibre, electro-physiologists have confined their experiments to its action on *voluntary muscles;* but I claim that it follows as a logical sequence that it will refresh and restore *any* muscle, voluntary or involuntary, which it will cause to contract. The explanation which I offer to account for this phenomenon is that the *electrical force*, which acts on the muscular fibre and causes it to contract, is, if not identical with the nervous force, so very nearly allied thereto that, to a certain extent, it takes the place of and acts in conjunction with this force, and that, therefore, when the work of the muscle is complete, there is a greater degree of nervous force remaining in the nervous centres than if the electrical current had not been employed as an auxiliary; in short, *nervous force has been conserved*. To show that this is a reasonable deduction, let me call attention to Beard and Rockwell ("Med. and Surg. Elect.," p. 146), where they say that "the combination of the force of the will with electricity is very much more efficacious than either when used alone. When a muscle becomes so diseased (or exhausted?) that the will is powerless to contract it, the electricity may contract it with ease. Where electricity alone causes feeble or imperfect contraction, electricity co-operating with the will may make the contraction vigorous and complete. In order to make experiments of this kind fully

successful it is necessary that the will and the force should be concentrated *simultaneously with the closing* of the circuit,[1] and yet experience shows that the effect of electrization, if not too long continued, is to give tone to the muscle, so that it responds more readily to the will for several minutes, or even hours, after being subjected to the electrization."

As a consequence of this conservation of nervous force, the woman who has enjoyed the beneficent effects of electricity as an oxytocic, and has been aided by it in her muscular throes, suffers *not* from fatigue, shock, or exhaustion, but presents herself as the happy possessor of a sufficient stock of nervous force to carry her safely through her convalescence.

I hope I may be pardoned for not attempting to substantiate my conclusions by offering records of cases in my practice; for, after all, the conclusions drawn from them would simply be another reflection of my *opinion*. I have deemed it best to try and show that these conclusions are based upon scientific principles, and to try and point out where we can render these well-known principles available in practice, remembering that these facts have "long been known without any practical application ever having been made of them." For me to say that *any* remedy or measure has exhibited an oxytocic action, and abbreviated the course of a labor, would be a gratuitous offering on my part, as the statement could not be based upon exact or reliable data. What I *have* offered can be put fully to the test of experience by any one who is familiar with the operations of a faradic apparatus, and then, if he can see, as I have seen in hundreds of cases, a rapid and decided manifestation of its beneficial effects, he will pardon me for not encumbering this paper with a dry detail of cases. In order to measurably sustain my conclusions, I beg to lay before the reader extracts from private letters from medical friends who have recently adopted this agent into their obstetric practice, and I may here state that they are medical gentlemen who are distinguished in this State for their good judgment, and for the accuracy of their observations.

Dr. R. G. Williams, Whitney, writes, referring to the cases in which he had used it: "If I am to judge of its effects upon others as it was demonstrated to me upon these cases, then I cannot say sufficient in its praise. Were it wholly useless in all other cases, its use in the lying-in chamber would fully justify any physician in the outlay of all moneys expended in obtaining a first-class faradic battery. It certainly acts as an oxytocic, for it undoubtedly hastens labor. It relieves the suffering woman of all false pains, and evidently gives tone and strength to the abdominal muscles, and at the same time causes equable and firm contractions of the muscular fibres of the uterus. The happy effects of electricity in these cases is evidently not wholly confined to its action upon the uterus and surrounding tissues, but certainly through the spinal cord its sedative effects are transmitted to the brain."

Dr. T. L. Wilson, Seymour, writes: "Electricity in obstetrics, in my judgment, is the very best, as well as the simplest means we have of stimulating uterine contractions, in atony, and especially in post-partum hemorrhage. For the latter, I want nothing else but electricity."

I have already referred to uterine manual pressure, the forceps, and ergot as means which are in general use to facilitate delivery, and have spoken of the conjoined use of uterine manual pressure and electricity; and here I wish to say that in all cases of instrumental delivery, it can also be used as an auxiliary. Furthermore, I consider I am justified in believing that, were electricity in general use as an oxytocic, through its action as a prophylactic against exhaustion, cases wherein instrumental delivery is *instituted for that cause* would be almost entirely obliterated from the records of practice.

No physician of the present day would jeopardize the welfare of his patient by applying the forceps and dragging the fœtus out of an uncontracted uterus, but in all such cases he would endeavor to first preserve as vigorous contraction of it as possible; and for this purpose why not use the faradic current when we see that it is the most certain, speedy, and safe agent we can employ? Of ergot I simply wish to present a tabulated comparison with electricity, so that it may appear at a glance what I consider the true value of each.

[1] This can always be effected at the time of the rhythmical uterine contraction.

ERGOT.	ELECTRICITY.
1 Action slow—no response until after twenty or thirty minutes have elapsed, thus *losing time*, thereby occasionally proving fatal to the patient.	1 Action instantaneous, thus *economizing time*, and so in some cases proving of great value to the patient.
2 Action uncertain, in some instances it will entirely fail to produce uterine contractions.	2 Action certain; it need never fail to produce uterine contractions.
3 Action uncontrollable; it will sometimes "lash the uterus into a fury," which may produce laceration of the cervix or perineum.	3 Action under perfect control of the operator; therefore it may never endanger the integrity of the cervix or perineum.
4 Action always followed by shock, and sometimes by great exhaustion.	4 Action never followed by either shock or exhaustion.
5 Action attended with danger, and *always* with an increase of suffering.	5 Action harmless, and *always* attended with a diminution of suffering.
6 Action continues, allowing no time for rest, thus violating one of the wisest provisions of nature.	6 Action rhythmical, "giving ample time for rest," thus stimulating nature."
7 It cannot be safely employed until dilatation of the os is well advanced; therefore its use is restricted to the latter part of the second, and to the third stages of labor.	7 It may be employed as soon as the first labor pains set in, and thus facilitate the labor in all its stages.

Methods of Application.—It will be observed from the preceding pages that those who have employed electricity as an oxytocic have applied it by various methods, and with few exceptions each observer has claimed beneficial results. Now, without reflection, this might seem confusing and contradictory, and it might be claimed that a remedy which admits of such a variety of methods of application might in some way mislead the judgment of the operator, and therefore his conclusions would be of no practical value. But when we come to consider the various structures to which the current may be applied, and *produce contraction of muscular fibre*, it will at once appear that each method employed would be effective, as there has been no method spoken of which would not include some one or more of these structures within the circuit. It will be remembered that in order to stimulate muscular fibre to contraction by means of electricity, it becomes necessary that the current should affect either the muscle itself, the nerve which supplies it, or the plexus from which the nerve emanates; and, therefore, it may be inferred that any method which may be adopted, which will include either the uterus or the uterus and the spinal cord in the circuit, will contain some elements of merit. I do not by any means regard all of these methods as possessing equal value, and a comparison of the merits and demerits, as I understand them, of some of the methods most generally used, may not be out of place here.

Dr. Radford proposed the application of one pole of the faradic current to the abdominal parietes over the fundus uteri, and the other to be directed to the os and cervix. Mr. Cleveland advised both poles to be applied externally to the abdominal parietes; while Dr. F. W. McKenzie claims that the positive pole should be applied to the nape of the neck, and the negative to the os, "for acting energetically on the contractile fibre-cells of the uterus." Tripier faradizes the lumbar region. Dr. A Murray applies one pole to the sacrum and the other to the abdominal parietes. Now there is no one of the above-described methods which would not include the uterus, its nerves or nerve plexus within the circuit, therefore either method would promote uterine contractions. Dr. Radford's method (and it has been adopted and recommended by most writers on the subject), includes the muscular fibres of the uterus in the direction of

their long axis, and therefore it must of necessity be very effective, but it is open to one very serious objection, that of bringing one or the other pole in too close proximity to the head of the fœtus; and this objection would hold good either in case of a vertex or a breech presentation. In a former part of this paper, I referred to the warning given by some writers on this subject, where they say that "there is great danger of producing the death of the child, etc." I promised to show that by proper applications this danger could be easily avoided, and it is this very application of Dr. Radford's against which I would wish to enter a protest, as being in a high degree dangerous to the child. In a case of vertex presentation, the pole applied to the os and cervix would bring a current of great density almost in direct contact with the head of the fœtus; and in case of breech presentation, the pole which is applied to the fundus uteri would also be in close proximity to its head; and this, too, in either case, while the head of the fœtus is bathed in fluids containing salts which render the current highly penetrating. When it is taken for granted that any physician who possesses a sufficient amount of intelligence to handle a faradic apparatus knows full well what highly painful and injurious effects will follow the application of even a mild faradic current to the head, I think I will be justified in recording the following rule which I adopted when I first commenced using electricity as an oxytocic, and that is: *Never to make the application in such a manner as to include the head of the fœtus in the circuit* in any case where its welfare is to be considered. By strictly adhering to this rule, I have never seen any ill effects produced on the child, nor had the least apprehension of it.

Mr. Cleveland's method would undoubtedly promote vigorous contractions, if the poles were so placed as to include the muscular fibres of the uterus in the direction of their long axis, and it would have this advantage over Dr. Radford's method, that the application could be made in such a manner as not to include the head of the fœtus in the circuit. Dr. McKenzie's method is doubtless very effective, since it more directly affects the motive centre for uterine movements in the medulla, but in case of vertex presentation, it would be subject to the same objection as Dr. Radford's method. Dr. Tripier faradizes the lumbar region, and therefore brings under the influence of the current the lower portion of the cord and the hypogastric plexus. Besides being efficient, it certainly has the merit of being entirely safe. Dr. A. Murray's application (one pole to the sacrum, and the other to the abdominal parietes) includes the lower portion of the cord, the hypogastric plexus, and the musular fibres of the uterus; not however, in the direction of their long axis. It is a very safe and effective manner, as I can testify from its use in all the cases (now over 220) which I have subjected to this treatment. In making the application in this manner, the current is passed through the body and limbs of the fœtus, and by the time that the current has reached the fœtus, it is so diffused as to render it impossible to affect it deleteriously in any way. If I should ever encounter a case in which this method should "fail to produce uterine contractions when most needed," I should then adopt Dr. Cleveland's plan, or if it were a case of breech presentation, Dr. F. W. McKenzie's method I would consider the best.

I have no ambition to acquire distinction through the medium of tediousness, but it would afford me great pleasure to be so explicit in this paper that any physician who would like to investigate this subject at the bedside of the parturient, would here find every question anticipated and fully answered which would arise in his mind in reference to the minutest details of the application, so that at least he would have *some* light for his footsteps on a dark pathway. But I hope I will not be understood as offering my plans or methods of using electricity as an oxytocic as being the *best* which can be devised or is in use; I only offer them for the consideration of those who are interested, and because they have met and fulfilled every indication in my limited experience, and with the hope that those who are using methods superior to mine will be induced to give them to the profession. Therefore, I hope I may be allowed to commence at the beginning and briefly recapitulate.

Apparatus.—Any good, reliable induction apparatus will answer, but it *must* be reliable and in perfect order, otherwise it will most likely fail at the very moment its services are most required. I use one which was manufactured by Dr. Jerome Kidder for Dr. Heed and myself sixteen years ago, and it is still reliable, although having been in constant use during all that time. This is the one he calls "The Physician's Visiting Machine;" but when it is not convenient to carry one so bulky, I use a "Pocket Induction Apparatus," also manufactured by J. Kidder. This is very convenient, and gives

all the current which could be required in any case. The only objection to it is that, if its use is required for longer than one hour it will be necessary to recharge it.

Electrodes.—I use one small copper plate, one and one-fourth inches wide and five inches long, one large surface sponge-electrode, and also one wrist electrode.

Application.—As soon as I deem it necessary to make the application, I do so in the following manner: The patient is placed in a dorsal position. I then attach one cord to the copper plate, and covering it well with a napkin wet with *warm water*, apply it to the sacro-lumbar region. The other cord I attach to the wrist electrode. I now set the machine in action and attach both the cords to it,[1] the one connected with the plate to the positive pole. Then slide it under the bed or couch, where it and the cords will remain out of the way of the necessary attendants. The wrist electrode I now attach to one of my wrists (first covering the wrist with a napkin wet with warm water), then close the circuit by applying the hand (well moistened with warm water) of that wrist to the abdominal parietes.[2] By this means I am able to determine the exact condition of the uterus, and to note correctly all the changes which may occur in its contour, and I can also estimate the amount of increase which occurs in its contractions, and I am also enabled to perform uterine manual pressure, and if it is necessary to use both hands for this purpose, it can readily be done, and each hand then conveys the current to or from the uterine walls. When the application is made in this way, it enables the operator to estimate correctly the strength of the current which he is applying, and the hands being much more sensitive to the current than the abdominal walls, as long as he continues the operation through his hand, there will not be the slightest danger of his producing any unpleasant effects upon his patient, but on the contrary, a current as strong as can be borne ordinarily by the operator's hand will have a pleasant and soothing effect upon her. If an operator were timid, or could not bear a current of sufficient strength through his hand to be effective, he could then use a large surface sponge electrode in place of his hand, but if he does this, he should first test the strength of the current with his hand before applying it, in order to be very certain that it was not too strong at the commencement, as otherwise he might induce painful spasmodic contractions of the abdominal muscles, which would be most likely to cause a hasty suspension of the experiment. It is always best to begin with very mild currents, and gradually to increase them to the desired strength. I always make the application with the hand *continuous* until a sufficient amount of sedation is produced (from five to thirty minutes), then I open the circuit by removing my hand, during the interval between the pains, and close it again when the pain recurs. In short, after all reflex pain has been subdued, and the patient rests well in the intervals, I then *only keep the circuit closed during the time occupied by the rhythmical contractions of the uterus.* By this intermittent application, we are effectually guarded against the danger of destroying the electro-muscular contractility of the muscles which we wish to stimulate and strengthen, and in my opinion it was owing to a neglect of this precaution which led to the results spoken of by Dr. Kilner when he said: "The current sometimes failed to produce contractions when most needed. After its use for an hour or one and a half hours, its sedative effects were manifest, but it no longer increased the uterine contractions." Now, it is evident to me that, if he had used it for an hour or an hour and a half continuously, he had produced a condition of paralysis or destroyed the electro-muscular contractility of the muscular fibres of the uterus and, therefore, the current was powerless to longer increase the uterine contractions.

Beard and Rockwell say: "Experience shows that the effect of electrization, *if not too long continued*, is to give tone to the muscles." (Italics mine.)

I have used it in this manner, in tedious labor, for twenty-four hours; and during all this time it furnished to the nerves and muscles all the elements of increased *strength and rest*, as was fully evinced by the ability of the patient to withstand her pains, and by her earnest desire, often reiterated, "not to allow her to have a pain without closing the circuit." Whenever it becomes necessary for me to support the perineum (and often sooner, if I need rest), I instruct a nurse or friend how to make the applications, to open and close the circuit, being careful to direct her that with

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[1] The wrist electrode may be dispensed with by taking any common electrode in one hand, and applying the other hand to the abdomen of the patient, allowing the current to pass through both arms of the operator.

[2] Using 1st and 2d coil (B D current) of the apparatus.

each recurring pain to change the location of the electrode, so that *all* the muscles engaged may be brought *directly* under the influence of the current. As soon as I wish to facilitate the labor (at the beginning of the second stage), I use a current of as much force as the patient can bear with comfort, and in practice it will be found that the stronger the current used in this stage (short of producing spasmodic contractions of the abdominal muscles) the better it will suit the feelings of the patient. After the perineum is well dilated, I moderate the force of the current, and in cases where I have any reason to apprehend danger, to the integrity of this structure, I withhold it entirely for a few minutes prior to the escape of the fœtal head from the vulva, so as not to hasten unduly the labor at this stage, and to give ample time for its full, free, and safe dilatation. As soon, however, as the head escapes, I direct the circuit to be closed *most* of the time until after the completion of the third stage of the labor, which in nearly all cases occurs with but little or no assistance in a very few minutes. In all of my cases in which I have used it, the placenta has been expelled in from one to ten minutes from the birth of the child, with very slight or no traction upon the cord. This I regard as more simple, far less painful, and fully as speedy and efficient as Prof. Crede's method.

Special Indications for the Employment of Electricity as an Oxytocic.—Electricity may be deemed indicated in any case where it may be desirable:

1. To modify the pains of labor.
2. To favor a more rapid dilatation of the os.
3. To promote more vigorous uterine contractions.
4. To add tone and strength to all the muscles engaged, and "increase their power of doing work."
5. To abridge the time occupied by the labor.
6. To prevent shock, exhaustion, and post-partum hemorrhage.
7. To insure contraction of the uterus in cases of instrumental delivery.
8. To act as an auxiliary in the induction of premature labor.
9. To arrest hemorrhage, and accelerate labor in cases of placenta previa.
10. To prevent an undue expenditure of nervous force, in all cases of debility from whatever cause, thus leaving the patient in a condition to secure a speedy and favorable convalescence.

In concluding my remarks on this proposition, it only remains for me to say that, as an oxytocic, to promote uterine contractions, and facilitate labor in all its stages, according to my limited experience with this subtle agent, all that has been quoted from our best writers in its favor *is true*. I recognize the fact that my experience with it for these purposes will probably be considered as liable to many sources of error, however honest I may be in my convictions, or in my desire to portray truthfully the results of my observations; and that when I attempt to *prove* that my agent has exhibited an oxytocic influence, and facilitated labor, and abridged the sufferings of my patient, I am at once placing myself in an embarrassing position; because I am compelled to ask my reader to accept my unsupported (by exact data) statements for *facts*. When I say that upon my approach to the bedside of my patient, I found the os dilated barely sufficiently to admit the point of my index finger; that I then made an application of the faradic current, and that it promoted contractions of the longitudinal and oblique muscular fibres of the uterus, thereby rapidly dilating the os; that in one hour the second stage of labor was ushered in; that in thirty minutes more the third stage was completed (and I *adhere* to the statement that the rapidity of the course of the labor was due to the measures adopted); that I had said nothing which might *not* be said of the unassisted course of a natural labor—this reflection consoles me, namely: that if my reader will attach any importance to my statements, and will faithfully follow in my footsteps, he will cheerfully sustain me in all that I have claimed. I am fully aware of the fact that any physician who has enjoyed even a moderate amount of obstetric practice can readily refer to cases in which he has observed the same happy results in which no measures were adopted to facilitate the progress of the labor; and I am also aware of the further fact that he can with *equal* readiness refer to a *far greater number of cases* in which he would, at the time in which they were in progress, have cheerfully been willing to have made almost any personal sacrifice for the use of a reliable oxytocic, one which would have rendered him service at any stage of the labor. When his patient suffered from pains not only ineffectual, but rapidly exhausting her

nervous forces; when her increasing anxiety and distress acted like a contagion upon the friends of her household; when precious time hung heavily upon his hands, and he was unwillingly compelled to witness sufferings which he had no power to control or abate; when, from his ripened experience, he *knew* that this undesirable condition of affairs would not only continue for an indefinite number of hours, *but was certain to grow worse;* when every recognized measure had been faithfully carried out; when there was nothing left for him to do but to apply "uterine manual pressure," as the safest and best oxytocic, at the risk of impressing her with a deep conviction that her condition was full of peril—what would he then have given if the hand with which such manual pressure was made, formed one electrode of a good, reliable induction apparatus, especially if the vitalizing current from it furnished a sedative force to every sentient nerve involved, a stimulating force to every motor nerve and to every muscular fibre engaged? If this new force, this sensible increase of power, gratefully recognized as such by the patient, soothed her pain, refreshed her muscles, restored her strength and waning confidence, would not the physician, from the very depths of a thankful heart, have been ready and willing to exclaim: "Electricity stands unrivalled as an oxytocic"?

Electrolysis in Strictures of Urethra.

By Dr. Robert Newman, of New York.

Dr. Newman gives the following directions for the management of the battery, etc.:

1. "The *battery* needed is any good, steady *galvanic* battery.
2. "The *fluid* for the battery ought not to be too strong.
3. "*Rheostat* and *galvanometer* attached to the batteries are convenient niceties, but for our purpose and the battery used *not* necessary.
4. "For the positive pole a carbon electrode is used, covered with sponge, moistened with warm water, and held against the cutaneous surface of the patient's hand, thigh or abdomen.
5. "For the absorption of the stricture, the negative pole is always used.
6. "Electrode bougies are firm sounds insulated with a hard-baked mass of rubber; the point is a metal bulb, egg-shaped, which is the acting part in contact with the stricture. These electrode bougies are made by instrument makers.
7. "The curve of the bougies is short; large curves are mistakes.
8. "The plates must be immersed in the battery fluid before the electrodes are placed on the person; and raised again after the electrodes have been removed.
9. "All operations must begin and end while the battery is at zero, increasing and decreasing the power of the current slowly and gradually; avoiding any shock to the patient, or any interruption to the current.
10. "Before operating, the susceptibility of the patient to the electric current should be ascertained.
11. "The problem is, to absorb the stricture, not to cauterize.
12. "At first it is best to operate only by the first method of absorption: '*weak currents at long intervals.*'
13. "The exact number of cells to be used cannot be given; it must be regulated according to the work to be done. As a general rule, six to twelve cells may be used.
14. "The seances should be at intervals, not too frequent in succession.
15. "The best position for the patient to assume during the operation is that which is most comfortable for him and the operator. I prefer the erect posture, but the recumbent or others may be used.
16. "Anesthetics I like to avoid; I want the patient conscious, so that he can tell how it feels.
17. "Force should never be used; the bougie must be guided in the most gentle way; the electricity alone must be allowed to do the work.
18. "During one seance, two electrodes in succession should never be used.
19. "All strictures are amenable to the treatment by electrolysis.
20. "Pain should never be inflicted by the use of electrolysis; therefore it should not be applied when the urethra is in an acute or even subacute inflammatory condition.—*N. E. Med. Mo.*

Electro-Therapeutics.

By W. T. Baird M. D., Albany, Texas.

In the Texas Courier-Record of Medicine, April, 1885.

Our own American writers, and especially Beard and Rockwell, have done more to give us the true status of medical electricity than all of the other authors combined, and as they have been particular to give us the differential indications for the use of the two currents, and also give us the advantages of one or the other current in different pathological conditions, and as this has not been done in a systematic manner by any other authors, I think that a reference to them on this question will be duly appreciated.

In giving the general differential indications for the use of the two currents, they say that the Galvanic current should be used:

1. To act with special electrotonic and electrolytic power on the brain, spinal cord, sympathetic or any part of the central or peripheral nervous system.
2. To produce contractions in paralyzed muscles that fail to respond to the Faradic current.
3. In electrosergy to produce electrolysis or cauterization.

The Faradic current should be used to act mildly on the brains, spinal cord, sympathetic, or any part of the central or peripheral nervous system.

Second, to excite contraction in paralyzed muscles, and to produce strong mechanical effects.

The advantages of the Galvanic over the Faradic current are:

1. Greater power of overcoming resistance.
2. A greater power of producing contraction in paralyzed muscles in cases where the Faradic fails.
3. A far more patent electrotonic, electrolytic and thermic action.

The advantages of the Faradic over the Galvanic are:

1. By virtue of its frequent interruptions it more easily produces muscular contractions when passed over the muscles and nerves which supply them.
2. It produces greater mechanical effects.
3. It is less likely to produce unpleasant and harmful effects when incautiously used.

Now a proper analysis of the above indications and advantages would require more space than it is possible for me to allot to this paper, but I will state in general terms that the cases which can be subjected to the beneficial effects of the Faradic current will far outnumber in general practice those that require treatment exclusively by means of the Galvanic current. In the first place we see that when we wish to produce electrotonic or electrolytic effects on the brain, spinal cord, sympathetic or any part of the central or peripheral nervous system, that the Galvanic current has the advantage, although the Faradic will accomplish all these only in a milder degree.

We will take, for instance, a case of neuralgia of the fifth pair of nerves, and it may disappear almost as if by magic under the influence of the Galvanic current, but at the same time it may be cured by more persistent efforts with the Faradic current. In some cases of paralysis the Faradaic current is utterly useless until after the nerves supplying the affected muscles have been subjected to the influence of the Galvanic stimulus, and then the cure may be completed with the Faradaic current. These cases, however, are rare, a vast majority of cases of paralysis will yield to treatment by the Faradic current alone. Its greater power of overcoming resistance imparts to the Galvanic current a far greater degree of usefulness in treating obstinate and long standing cases of functional diseases of the brain, spinal cord and sympathetic nervous system.

In electrolysis, and as a cautery, only the Galvanic current can be used with any benefit.

In the destruction of tumors, in cases where it would not be best to remove them by excision, in cases of stricture and cases of irritable urethra, in cases of chronic granular conjunctivitis; and finally I will mention cases of extra uterine pregnancy; in all these the use of the Faradaic current can never be substituted for the Galvanic. "By virtue of its frequent interruptions the Faradic current more easily produces muscular contractions when moved over the muscles or the nerves which supply them."

It is *this* property of the Faradic current which extends its beneficial results to almost endless limits.

It is to this property, which by giving passive exercise to all the tissues, both superficial and deep-seated, which may be brought under the influence of the current, that we may attribute its remarkable *sedative* and *tonic* effects.

It is by virtue of this property that we are enabled to produce contraction of paralyzed muscular tissue, and to restore tone to the nerves which supply it, and, at least, to arouse latent force in the centres from which they emanate. It is from this property that we derive benefit in cases of fatigue and exhaustion of muscular tissues. It refreshes and restores them at once to their former vigor, as in obstetric practice, where it is used to assist the uterine and abdominal muscular fibres in overcoming the resistance offered by the passage of the fœtus through the pelvic outlet, and to prevent exhaustion of the same structures after the work has been completed.

And, finally, this is the current which can be used with the most benefit in all acute inflammations, for its *sedative effects*.

I cannot close this paper without referring to what Beard and Rockwell say as to the Faradaic current being less likely to produce unpleasant or harmful effects when incautiously used. This proposition I consider to be strictly true: when the Galvanic current may be improperly used, permanent direful results may be accomplished in a very few seconds, and the patient nor the physician not be aware of it until after the mischief has been wrought. But this cannot be the case where the Faradic current is used; for, if the current should be used entirely too strong, the pain produced by it would soon warn the physician and patient, and it could be moderated or suspended.

The worst effects that I have ever seen from the use of the Faradic current is that it will sometimes over-stimulate the cardiac nerves of inhibition and produce syncope, but I have never seen this occur after the first few treatments and the system had becomes habituated to the electrical stimulus.

Now, as we see that the Faradic current is the safest and the cheapest, and the Faradic battery is the most portable, and that it can be used with benefit in a far wider range of diseases, in my opinion, "it is the best form in which it can be used with benefit."

GALVANO-CAUTERY IN ULCERS.

By F. Cornwall, M. D., San Francisco.

California Medical Jonrnal.

I wish to chronicle the fact that galvano-cautery is our most potent remedy for the cure of syphilitic and strumous ulcerations of the throat. So far as I am aware, galvano-cautery has not been recommended for this condition in the throat. In two cases which I had treated with Dr. Logan, after several months of persistent local and constitutional treatment, which improved the general health but merely mitigated the ulceration, galvano-cautery cured by two slight applications. This leads me to think that the remedy would be one of our best in ulcerations in other localities. It is already used with very extraordinary effect for indolent ulcerations of the cornea.

It is my opinion, verified from a somewhat extended use of the agent, that any surgeon of an extensive practice who does not employ galvano-cautery is certainly failing to have much of the success which he otherwise would.

ELECTROLYSIS IN MEMBRANOUS LARYNGITIS.

By F. E. Waxham, Chicago.

Reports a case of membranous croup with very severe symptoms of laryngeal stenosis. An intubation tube was introduced, and made the negative electrode by connecting it with a platinum wire. A current of eight cells was passed. The symptoms improved, and the child recovered.—*Medical Record, Jan.* 15, '87.

GLOSSARY.

We herewith present a brief vocabulary of the more general terms used in the Medical Branch of Electrical Science.

Amalgamation. Coating the surface of the zinc (exposed to the action of the acid) with Mercury by immersing into dilute Sulphuric Acid, and then rubbing over the surface a small quantity of Mercury. Protection from a rapid waste.

Amalgamating Fluid. To 7½ oz. of Nitric Acid and 22½ oz. of Muriatic Acid add 6 oz. of Mercury. Carefully heat, and when dissolved add 30 oz. of Muriatic Acid. If the zinc is dipped into this fluid for a few seconds it will be completely amalgamated, even if greatly corroded.

Anode. The positive pole, or "up way" opposite to Cathode. So named by Faraday.

Armature. See Vibrating Armature.

Battery. A cell or jar containing the exciting fluid and plates. Voltaic cell.

Break. An opening or severing of the circuit, preventing the passage of the current.

Break Circuit. See Circuit-Breaker.

Cathode. The negative pole, or "down way," opposite to Anode, so named by Faraday.

Cautery. Burning. See Electro-Cautery.

Cell. The jar or vessel to contain the exciting fluid.

Cell-Elector. A device for electing any number of cells in the circuit.

Circuit. A continuous electrical communication along which the current travels.

Circuit-Breaker. A device for making and breaking contact at pleasure; or operated automatically.

Commutator. A device for changing the polarity of a current when passing on a conductor, or to change from one to more cells of a galvanic series.

Coil. See Helix.

Conductivity. The opposite of resistance.

Conductors. Substances which most freely permit the current to pass. See cords.

Constant Current. See Galvanic Current.

Connections. Metallic wires or bands, completing the circuit between cells apparatus or other devices.

Cords. The conductors leading from the Battery or Helix, to the Electrodes.

Core. A bundle of wires, or bar of the purest and softest iron, so as to allow of rapid magnetization and demagnetization.

Current. The supposed flow or passage of electricity or electrical force in the direction from positive to negative. It, therefore, originates at the zinc surface in contact with the solution, and passes from the zinc to the negative element *in the liquid* of the battery, but *from* the negative element to the zinc in the external circuit.

Constant Battery. A battery so arranged as to produce a uniform strength of current for a long time, without polarizing. Opposite of Inconstant Battery. An apparatus arranged of a series of batteries, used to generate the constant, or Galvanic current.

Density. The term "Electric Density" signifies the quantity of Electricity per unit area on a charged conductor.

Dynamic Electricity. Electricity in a state of action. Opposite of Static Electricity.

Electro-Cautery. Burning or searing by Electricity.

Electro-Motive Force. The force of a battery, or tension of the current, is the power which it has to transmit a current against resistance.

Electrodes. The instruments used in the application of Electricity. The free ends of a voltaic battery.

Electrolysis. Decomposition by the action of Electricity or Galvanism.

Electrolyte. The subject for, or decomposed.

Elements. The plates acted upon by the exciting fluid.

Faradaic Current. Named after Michael Faraday, F. R. S., the English Physicist. See Induced Currents.

Galvanic Current. The direct current from a series of batteries.

Galvanometer. An instrument for measuring galvanic currents.

Helix. The coils of wire of an Electro-Magnetic, or Induction Apparatus, consisting of two or more coils.

Hydrostat. Water stopper. A cover which prevents the fluid from spilling or slopping out, and makes the battery perfectly portable.

Inconstant Battery. Opposite to Constant Battery.

Induced Currents. Currents of Electricity generated in coils of wire by Induction. Secondary Currents. Also Faradaic Currents, which see.

Induction Coil. The coils of the Helix wound over the Primary coil of wire.

Interrupter. See Circuit-Breaker.

Interrupted Current. A current rapidly interrupted by a vibrating Armature, or Rheotome.

The currents from an Induction Apparatus, are sometimes called interrupted, but all currents can be interrupted.

Intensity. See Electro-Motive force.

Local Action. Action in the battery, from a variety of causes. To wit: Accumulation of Salts, Oxidation, or allowing the free ends of the connecting wires to come in contact with one another.

Negative Pole. *In the Battery*, below the surface of the exciting fluid, the Carbon, Copper, or Platinum Conductor. Above the surface of the exciting fluid the Zinc Conductor.

Non-Conductor. See Poor Conductor.

Poles. The free ends of a battery, or induction coil. See cords.

Poor Conductors. Any material that does not freely conduct the Electrical Current.

Positive Pole. *In the Battery* below the surface of the exciting fluid, the Zinc Conductor, or plate. Above the surface of the exciting fluid, the Carbon, Copper, or Platinum Conductor.

Primary Coil. The first coil of the Helix surrounding the core.

Primary Current. See Galvanic Current. Also the current from the first or Primary coil of wire of the Helix.

Quantity of Current. The amount of Electricity generated in a given time.

Resistance. The opposition presented to the passage of the current, by the material.

Rheophore. See Electrode.

Rheostat. A device for regulating the current, by offering more or less resistance to its passage.

Rheotome. See Circuit-Breaker.

Secondary Coils. The coils of wire wound over the primary coil of the Helix.

Secondary Current. The current derived from the Secondary Coils, by Induction. See Induced Current.

Static Electricity. Electricity at rest.

Tension. The Energy of Electricity to overcome resistance.

Vibrating Armature. See Circuit-Breaker.

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PREFACE TO THE SIXTH EDITION.

The changes and additions in this work, as successive editions have been issued, have been confined mainly to physics and physiology and the department of nervous diseases, where electricity has wrought its best results. While this agent is far from being a panacea, yet its increasing range of usefulness in medicine may be best illustrated by reference to those various additions. In the second edition the chapters on Electro-Physics and Physiology were largely rewritten; the method of central galvanization described and illustrated, electro-surgery more fully treated, and the relation of electricity to the diseases of children and of the skin considered in detail. In the third edition were given the highly satisfactory results following the treatment of exophthalmic goitre by galvanization of the sympathetic, and of some of the sequelæ of acute diseases by general faradization. The chapter on Electro-Diagnosis also was largely rewritten. A fourth edition was rendered necessary by a revival of the use of Franklinic electricity, due to vastly improved appliances and contained also the extraordinary results following the application of dynamic electricity to cases of extra-uterine pregnancy. The fifth edition discussed facts hitherto, and even now, but little appreciated, concerning the induction coil, its varieties, and the differential indications for their use.*

These statements the author deems worthy of careful consideration, and believes that further experience will result in still more important, as well as more definite, deductions. Within the past two or three years Apostoli, of Paris, has by his experiments and the results that he has succeeded in obtaining, greatly enlarged the domain of electricity in gynecology. The revision in the present edition, therefore, has been mainly restricted to this subject, and the chapter on the Diseases of Women almost entirely recast. The methods through which these better results in gynecology are obtained do but confirm the truth of the observation made in the Preface to the third edition, to the effect that the real scientific basis for the use of electricity in medicine and surgery is found in electro-physics more than in electro-physiology.

*The Induction Coils, above referred to, are those made by The Jerome Kidder Manufacturing Co., of New York City, New York.—J. K. Mfg. Co.

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In determining to publish a revised and enlarged edition of Clark's work on Electrical Medication, the author has been prompted chiefly by a desire to bring this system, in its practical bearings, more prominently before the medical profession. Having, during a practice of fifteen years, fully tested and proved to his own satisfaction and that of many others interested in the progress of medical science the efficiency of this agent, when properly applied as a curative power, he has felt that a more comprehensive work than any yet published was needed and would meet with general favor and appreciation. Since the announcement of its contemplated publication, the author has received repeated assurances of gratification on the part of some of those who had already procured and profited by the work referred to, as also from his medical friends generally, and he can only hope that the work, as now completed and offered to the profession, will meet their expectations and prove suggestive and helpful. It is not, of course, claimed that all persons can use this agent successfully in the treatment of diseases. There must be more or less of natural, as well as acquired ability or adaptation, and this is true in every department of applied science or art. It would not be reasonable to expect that a person almost totally devoid of mechanical genius, could manipulate such a complicated piece of machinery as a battery in such a manner as to harmonize with the more complicated machinery of the human system.

But with average medical skill, coupled with intelligence and discrimination, the most satisfactory results can and will be secured. This work has been prepared and published at the sacrifice of time and considerable outlay of means upon the part of its author, but if it will supply a want and succeed in awakening renewed interest in this phase of medical science, he will feel amply rewarded.

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INDEX.

PAGE.

Absorption by Electricity ... 75
Abstracts ... 65
Acoustic Nerve—Paralysis of ... 61
Æsthesiometer (write for list) ... 43
Affections of the Skin ... 85
Ague Chills ... 59
All Bodies Susceptible of Magnetism ... 16
Allotropic Physiology—Electro ... 2-16
Alternating Current Apparatus ... 34-35
Amalgamating Zincs ... 39, 41, 54
Amaurosis, Blindness from Paralysis of the Optic Nerve ... 59
Amaurosis ... 91
Amenorrhea ... 76
Anæsthesia ... 63
Aneurism, Aortic ... 89
Aortic Aneurism ... 89
Aphonia, or Suppression of the Voice ... 59
Aphonia, Complete, Cured ... 72
Apparatus, Electrical ... 26-41
Apparatus, Galvano-Cautery and Directions ... 40-41
Armature, Vibrating ... 54
Asphyxia by Drowning ... 59
Asthma ... 59-71
Atony of the Stomach ... 60
Attaching Sponge to Electrode ... 45
Awards ... 20-24
Bath, Electric ... 70
Batteries, care of, etc ... 53-54
Batteries, Constant Current and Directions ... 37, 38, 39
Batteries, Galvanic ... 37, 38, 39
Batteries, how to connect with instrument ... 54
Batteries, Upright Stopper ... 33
Battery, Tip ... 33-53
Bladder, Paralysis of ... 63
Blindness from Paralysis of Optic Nerve ... 59
Blindness and Deafness resulting from Cerebro-Spinal Meningitis ... 69
Books on Medical Electricity ... 112-114
Burners and Cutters, Platinum ... 40
Burns ... 60
Cabinet Apparatus ... 36
Cancer ... 60
Care of Apparatus, etc., Directions ... 53-55
Case of Instruments (write for list) ... 42
Cataract ... 60
Catarrh ... 60
Cautery Apparatus and Directions ... 40-41
Cautery Handle ... 41
Caution ... 55
Cell Batteries and Directions ... 37, 38, 39
Central Artery of the Retina, Embolism of ... 90
Cerebral Hemorrhage, Paralysis due to ... 92
Cerebral, Organic Lesion ... 62
Certificates of Cure ... 46-52
Chills, Ague ... 59
Chlorosis ... 60
Cholera, Prevention of ... 68
Chorea ... 60
Chronic Rheumatism ... 88
Coldness of Feet and Hands ... 60
Colds ... 60
Colic, Lead ... 74
Complete Aphonia Cured ... 72
Compound Circle Switch ... 42
Connecting Batteries with Instrument ... 54
Constant Current Batteries and Directions ... 37, 38, 39
Constipation ... 61
Convulsions, Hysterical ... 62
Cramps ... 61
Cramps, Writer's, and Analogous Conditions ... 72

PAGE.

Current of the Machines ... 58
Curvature of Spine ... 64
Cutters and Burners, Platinum ... 40
Deafness, Hysterical ... 83
Deafness from Paralysis of the Acoustic Nerve ... 61
Deafness resulting from Cerebro-Spinal Meningitis ... 69
Delirium Tremens ... 61
Diabetes Insipidus ... 88
Different Physiological Qualities of Electricity ... 18
Diphtheria ... 73
Directions for Attaching Sponge ... 45
Directions for Care of Apparatus, etc ... 53-55
Directions for Galvanic Batteries ... 38-39
Directions for removing and inserting plates of all our forms of Stopper Batteries ... 44
Disease of the Spine and Curvature ... 64
Disease of the Throat ... 64
Dropsy ... 61
Drowning, Asphyxia ... 59
Dyspepsia ... 61
Ecraseur ... 41
Electrical Humbugs ... 25
Electrical Publications ... 112-114
Electric Bath ... 70
Electricity as a Prophylactic and Therapeutic Agent in Obstetrics ... 94
Electricity as a Remedial Agent ... 55-56
Electricity in Obstetrics ... 94
Electricity, Revelations by ... 67
Electro-Allotropic Physiology ... 2-16
Electrolysis in Membranous Laryngitis ... 109
Electrolysis in Partial Trichiasis ... 65
Electro-Cautery Apparatus ... 40-41
Electro-Medical Apparatus ... 26-41
Electro-Therapeutics ... 57 to 109
Electrodes, Attaching Sponge to ... 45
Electrodes, case, etc. (write for list of Electrodes) ... 42, 43
Elements, where Packed ... 45
Embolism of the Central Artery of the Retina ... 90
Enlargements of the Joints ... 61
Enlargement of the Liver ... 64
Epigastric Pains in Hysteria ... 65
Epilepsy ... 61
Equal Alternating Current Apparatus ... 34-35
Excessive Perspiration, Hands, etc ... 76
Exhausted State of Nervous Centres, Paralysis ... 63
Exophthalmic Goitre ... 83
Falling of the Womb ... 61
Family Apparatus ... 30
Family Apparatus, Small ... 32
Faradization of the Spleen in Intermittent Fever ... 92
Faradism in Disease ... 82
Faradism in Infantile Marasmus ... 93
Feet, Coldness of ... 60
Felons ... 82
Fever, Intermittent ... 87
Fever (Faradism in Disease) ... 82
Galactagogue ... 90
Galvanic Batteries and Directions ... 37, 38, 39
Galvano-Cautery Apparatus and Directions ... 40-41
Galvano-Cautery in Ulcers ... 109
Gastritis ... 61
General Rules ... 57
Goitre ... 64
Goitre, Exophthalmic ... 83
Hairs, Removal of ... 84
Handle, Cautery ... 41
Hands, Coldness of ... 60

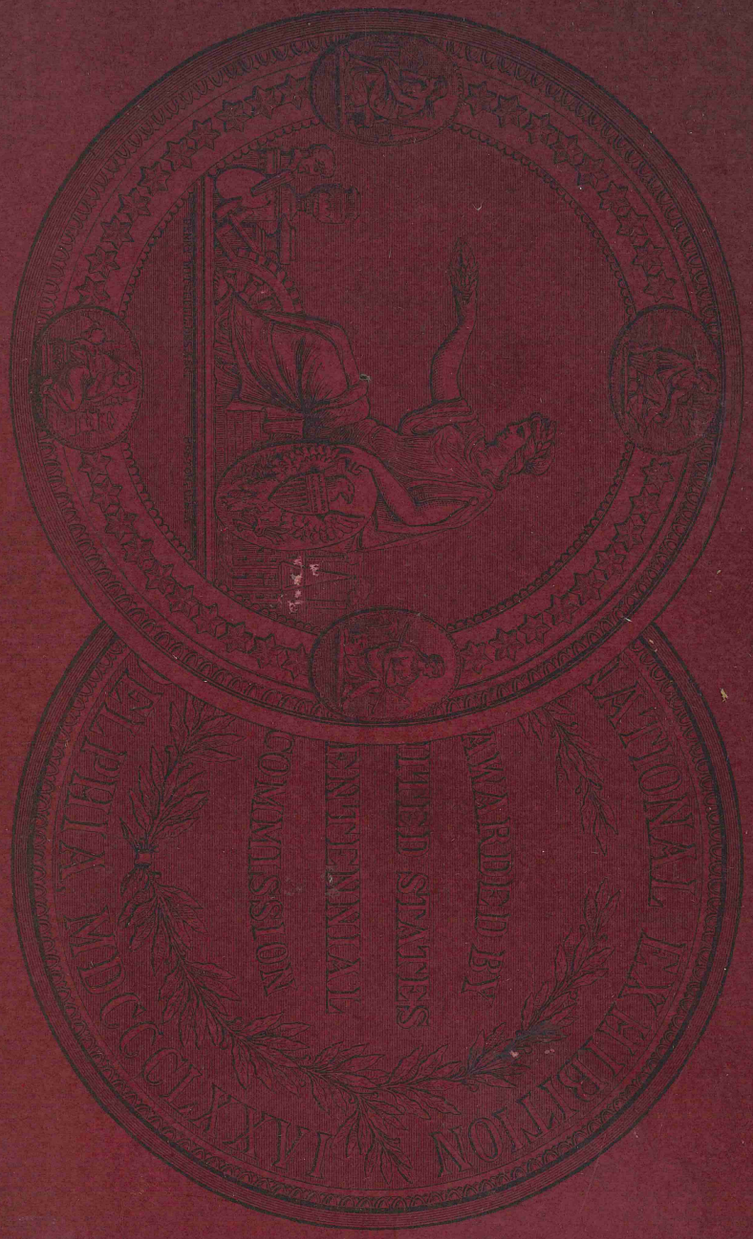
INDEX.

PAGE.

Headache ... 62
Heart, Weak ... 91
Hernia, Strangulated ... 87
Hiccough ... 75
Holders of Needles for Electrolysis ... 43
How to Connect Battery with Instrument ... 54
Humbugs, Electrical ... 25
Hydrarthrosis ... 86
Hydro-Rheostat ... 43
Hysteria, Epigastric Pains in ... 65
Hysterical Convulsions ... 62
Hysterical Deafness ... 83
Impotence ... 74
Induction Coil, its Varieties and the Differential Indications for their use ... 78-81
Infantile Marasmus, Faradism in ... 93
Infantile Paralysis ... 71
Insanity, Electricity in ... 70
Insipidus, Diabetes ... 88
Instruments, Case ... 42
Instruments (write for list) ... 42-43
Intermittent Fever ... 87
Intestinal Obstruction ... 82
Inventions, Useful ... 19
Involution, Sub ... 88
Joints, Enlargement of ... 61
Laryngitis Membranous ... 109
Laudanum, Narcotism ... 62
Lead Colic ... 74
List of Instruments (write for list) ...
Liver, Torpid or Enlargement of ... 64
Lockjaw ... 62
Lumbago ... 62
Machines, Electrical ... 26-41
Magnetism, all bodies susceptible to ... 16
Marasmus, Infantile, Faradism in ... 93
Marks, Wine ... 91
Medals ... 20-24
Membranous Laryngitis ... 109
Medical Books ... 112-114
Muscular Tremblings ... 61
Narcotism from Laudanum and Opium ... 62
Nasal Polypi ... 90
Needle Holders ... 43
Neuralgia ... 62-74
Obstetrics, Electricity in ... 94-107
Obstinate Vomiting, Treatment of ... 65
Obstruction, Intestinal ... 82
Office and Family Apparatus ... 30
Open Battery, Care of, etc ... 53-54
Opium Narcotism ... 62
Opium Paralysis ... 89
Ophthalmology ... 84
Optic Nerve, Paralysis of ... 59
Organic Lesion of the Cerebral or Spinal Centres ... 62
Organic Stricture ... 87
Paralysis, due to Cerebral Hemorrhage ... 92
Paralysis, Infantile ... 71
Paralysis, of Acoustic Nerve ... 61
Paralysis, Opium ... 89
Paralysis, Variety of ... 63
Partial Trichiasis, Electrolysis in ... 65
Perspiration, Excessive, Hands, etc ... 76
Physicians' Apparatus No. 1 ... 26-27
Physicians' Apparatus Nos. 2 and 3 ... 28-29
Physiological Qualities of Electricity ... 18
Physiology, Electro-Allotropic ... 2-16
Platina, Care of ... 54
Platinum Cutters and Burners (write for list) ... 40
Pocket Apparatus ... 27
Polypi, Nasal ... 90
Preventive of Cholera ... 68
Primary (Cell) Batteries and Directions ... 37, 38, 39
Publications, Electrical ... 112 to 114
Purchasers, Suggestions to ... 115

PAGE.

Qualities of Electricity ... 18
Qualities of the Currents of the Machine ... 58
Quicksilver must not touch Platina ... 54
Reducing Power of Apparatus ... 55
Removal of Hairs ... 84
Removing and Inserting Plates of Stopper Batteries ... 44
Revelations by Electricity ... 67
Rheostat, Water (see list of instruments) ... 43
Rheotome-Vibrating Arrangement ... 54
Rheumatism ... 64
Rheumatism, Chronic ... 88
Rickets ... 64
Rules, General ... 57
Sciatica ... 76
Scrofula ... 64
Sensation, Paralysis of ... 63
Singultus ... 75
Skin, Affections of ... 85
Small Family Apparatus ... 32
Smee's Elements (Rubber Stopper) ... 33
Solution for Faradaic Apparatus ... 53
Solution for Galvanic Apparatus ... 39
Solution for Electro-Cautery Apparatus ... 41
Spermatorrhœa ... 75
Spinal Centres, Organic Lesion of ... 62
Spinal Disease and Curvature ... 64
Spleen, Faradization of in Intermittent Fever ... 92
Sponge, Attaching to Electrode ... 45
Stationary Apparatus ... 36
Stand Apparatus ... 36
Stomach, Atony of ... 60
Stopper Batteries ... 33-53
Stopper Batteries, Removing and Inserting plates of ... 44
Strangulated Hernia ... 87
Stricture of Urethra ... 107
Stricture, Organic ... 87
St. Vitus's Dance ... 60
Sub-Involution ... 88
Suggestions to Purchasers ... 115
Summary as to Different Physiological Qualities of Electricity ... 18
Suppression of the Voice ... 59
Suspended Vital Function ... 66
Switch, Compound Circle ... 42
Switch, Use of ... 55
Ten Current Apparatus, No. 5 ... 31
Testimonials ... 46-52
Tetanus ... 62
The Induction Coil, etc ... 78-81
Therapeutics, Electro ... 57-109
Throat Diseases ... 64
Tinnitus ... 68
Tip Battery ... 33-53
Tip Battery, Care of, etc ... 53-54
Torpid or Enlargement of the Liver ... 64
To Reduce Power of Apparatus ... 55
Trichiasis, Partial Electrolysis in ... 65
Ulcers, Galvano-Cautery in ... 109
Upright Stopper Batteries ... 33-53
Urethra, Stricture ... 107
Useful Inventions ... 19
Vibrating Arrangement ... 54
Visiting Apparatus, Physician's ... 28-29
Vital Functions, Suspended ... 66
Voice, Suppression of ... 59
Vomiting, Obstinate, Treatment of ... 65
Water Rheostat (write for list) ... 43
Weak Heart ... 91
White Swelling ... 86
Wine-Marks ... 91
Womb, Falling of ... 61
Wrist Drop from Lead Poisoning ... 77
Writer's Cramps and Analogous Conditions ... 72
Zincs, Amalgamating ... 39, 41, 54



RESEARCHES

IN

ELECTRO-ALLOTROPIC PHYSIOLOGY

USES OF

Different Qualities of Electricity to Cure Disease.

By Jerome Kidder, M. D.

Fig. 10.

Fig. 5.

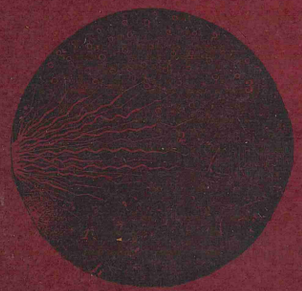


Fig. 3.

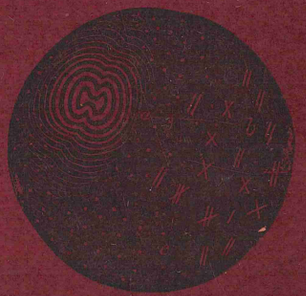


Fig. 12.

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